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PLANTS USED BY THE INDIANS OF EASTERN NORTH AMERICA.

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THE following list of plants used by the North-American Indians inhabiting the country east of the Mississippi River was compiled during a course given to students of Radcliffe College in 1899–1900, at the Peabody Museum, by Dr. Frank Russell of the Department of American Archæology and Ethnology of Harvard University.

The linguistic groups of Indians included in this article are two: the Algonquian, the greatest family group and most prominent at the time of the settlement of the country by the whites; and the Iroquoian, who by their efficient organization became very powerful in the midst of the Algonquian country.

The arrangement of tribes under linguistic groups is that followed by the Report of the Bureau of Ethnology at Washington, D.C., for 1885–1886. The material was gleaned from the Harvard College Library, the Boston Public Library, the Boston Athenæum, the Cambridge Public Library, and the libraries of the Museum of Comparative Zoölogy and of the Peabody Museum.

ALGONQUIAN FAMILY.

Algonquin. — Derivation: contracted from *Algomequin*, an Algonquian word signifying "those on the other side of the river," *i.e.*, the St. Lawrence River.

TRIBES REPRESENTED.

Abnaki	Menomine	Pequot
Algonquin	Miami	Pottawotomi
Blackfeet	Micmac	Savannah
Delaware	Narragansett	Sax and Fox
Kickapoo	Ojibway	Shawnee

Abnaki.

Bayberry (**18**, p. 33)[1]: the wax obtained was used with tallow for candles. — **Bean** (**9**, p. 25): used as food. — **Birch bark** (**9**, p. 29): the Abnakis used it to write upon. — **Maize** (**9**, p. 25): used as food. — **Reeds** (**18**, p. 10): mats made of reeds served as chairs and beds. — **Squash** (**9**, p. 25): used as food.

Algonquin.

Birch (**17**, p. 310): bark used for sheathing the frame of canoes. — **Elm** (**17**, p. 310): bark used for sheathing the frame of canoes and the filaments of the bark used to sew the sheathing of canoes together. — **Fir** (**17**, p. 310): the gum used to cover seams of canoes. — **Flag** (**11**, p. 77): the leaves of sweet flag used to thatch huts. — **Maize** (**40**, p. 58): used as food and the leaves used to thatch huts. — **Pine** (**17**, p. 310): wood sometimes used in building frames of canoes. — **Rushes** (**11**, p. 77): used in making mats. — **Squash** (**11**, p. 77): used as food. — **Tamarack** (**17**, p. 310): roots used to sew the sheathing of canoes together. — **Tobacco** (**11**, p. 77): chewed by the Algonquins. — **Wild rice** (**26**, p. 205): used as food.

Blackfeet.

Berries (**17**, p. 278): esteemed a delicacy when boiled in buffalo blood. — **Bull berries**, *Shepherdia argentea* (**16**, p. 203): used as food. — **Camass root** (**4**, p. 534): roasted bulbs used as food. — **Chokecherries** (**16**, p. 203): pounded up before eating. — **Maize**, *Psoralea esculenta* (**5**, p. 205): used as food. — **Red willow** (**4**, p. 534): berries

[1] The figures in bold type refer to the bibliography at the end of the article.

used as food. — **Sarvis berries**, *Amelanchier alnifolia* (**16**, p. 203): dried and stored for food. — **Stork's bill**, *Erodium cicutarium* (**17**, p. 422).

Delaware.

Dogekumak (**7**, p. 96): smoked with tobacco. — **Maize** (**40**, p. 58): used as food; leaves used to thatch huts. — **Rushes** (**11**, p. 77): used for mats. — **Squash** (**11**, p. 77): used as food. — **Sweet flag** (**11**, p. 77): leaves used to thatch huts. — **Sumac** (**4**, p. 534): leaves smoked with tobacco. — **Tobacco** (**11**, p. 77): smoked. — **Willow** (**7**, p. 96): the bark of the red willow is mixed with tobacco.

Kickapoo.

Acorns (**21**, p. 265): used as food. — **Beans** (**21**, p. 265): used as food. — **Birch** (**21**, p. 301): bark used for canoes. — **Blackberries** (**21**, p. 265): used as food. — **Corn** (**21**, p. 265): used as food. — **Cottonwood** (**21**, p. 301): used for canoes. — **Crab apple** (**21**, p. 265): used as food. — **Dewberries** (**21**, p. 265): used as food. — **Gooseberries** (**21**, p. 265): used as food. — **Gourds** (**21**, p. 265): used as food. — **Grapes** (**21**, p. 265): many varieties used. — **Groundnuts** (**21**, p. 265): used as food. — **Hazelnut** (**21**, p. 265): used as food. — **May apple** (**21**, p. 265): used as food. — **Melons** (**21**, p. 265): used as food. — **Osage oranges** (**21**, p. 265): used as food. — **Peas** (**21**, p. 265): used as food. — **Pecans** (**21**, p. 265): used as food. — **Plums** (**21**, p. 265): used as food. — **Potatoes** (**21**, p. 265): used as food. — **Pumpkins** (**21**, p. 265): used as food. — **Strawberries** (**21**, p. 265): used as food. — **Sweet myrrh** or *anise root* (**21**, p. 265). — **Tobacco** (**21**, p. 265): smoked. — **Walnuts** (**21**, p. 265): used as food. — **Whortleberries** (**21**, p. 265): used as food. — **Wild licorice** (**21**, p. 265): used as food.

Menomine.

Ash (**32**, p. 274): used in making bows. — **Basswood** (**32**, p. 258): fibre used in making mats; the inner bark is used in making string and ropes; wood (**32**, p. 254) used in building houses. — **Birch** (**32**, p. 254): bark used to cover the top and side of houses; also for canoes. — **Blueberries** (**32**, p. 291): used as food. — **Cat-tail flags** (**32**, p. 258): used in making mats. — **Cedar** (**32**, p. 258): bark used in making mats; white cedar (**32**, p. 293) used in building canoes. — **Cherry** (**29**, p. 52): wild cherry used as food. — **Corn** (**29**, p. 48): used as food. — **Crab apple** (**29**, p. 52): used as food. — **Currants** (**29**, p. 52): used as food. — **Gooseberries** (**29**, p. 52): used as food. —

Grapes (**29**, p. 52): used as food. — **Hazelnut** (**29**, p. 52): used as food. — **Hickory** (**32**, p. 274): used in making bows. — **Hops** (**29**, p. 52): wild hops used as food. — **Maple**, *Acer saccharinum* (**32**, p. 237): maple sugar made from. — **Oak** (**32**, p. 253): used in building houses. — **Pine** (**32**, p. 254): bark used in building houses. — **Plums** (**29**, p. 52): used as food. — **Pumpkins** (**29**, p. 48): used as food. — **Raspberries** (**32**, p. 291): used as food. — **Rushes** (**32**, p. 258): used in making mats. — **Snakeroot**, *Polygala senega* (**32**, p. 292). — **Strawberries** (**29**, p. 52): used as food. — **Tobacco** (**32**, p. 253): used as food. — **Whortleberries** (**29**, p. 52): used as food. — **Wild rice** (**29**, p. 47): used as food.

Miamoi.

Yellow lily, *Lilium canadense* (**3**, p. 312): roots used.

Micmac.

Apios tuberosa, *Saa-ga-ban* (**4**, p. 534): pear-shaped roots used as food.

Narragansett.

Chestnut (**6**, p. 46): used for canoes. — **Pine** (**6**, p. 46): used for canoes. — **Whitewood** (**6**, p. 46): used for canoes.

Ojibway.

Basswood (**35**, p. 236): used in making nets. — **Birch** (**1**, p. 9): bark used for the exterior of canoes; characters traced upon the inner surface of bark; these characters usually pertain to personal exploits (**27**, p. 59). — **Cedar** (**9**, p. 116): bark used in making rope or twine; used in making nets (**35**, p. 236). White cedar used to make the hoops for canoes; the roots used in sewing canoes (**1**, p. 9). — **Cherry** (**1**, p. 9): gum used in putting canoes together. — **Corn** (**35**, p. 236): used as food. — **Groundnut** (**24**, p. 55): used as food. — **Pine** (**24**, p. 73): wood used in making fire by friction. — **Potatoes** (**35**, p. 236): used as food. — **Red willow** (**24**, p. 135): bark smoked. — **Root**, *Oduhpin* (**24**, p. 55): used as food sometimes. — **Spunk** (**24**, p. 73): wood used in making fire by friction. — **Sumac** (**24**, p. 135): leaves smoked. — **Swan potato**, *Wahbeziepin* (**24**, p. 55): boiled and eaten. — **Tobacco** (**24**, p. 56): leaves smoked. — **Wild rice** (**3**, p. 120): used for food.

Pequot.

Corn (**39**, p. 4): used as food. — **Indian hemp** (**39**, p. 2): used to make twine.

Pottawotomi.

Beans (**17**, p. 82): used as food. — **Maize** (**17**, p. 82): used as food. — **Melons** (**17**, p. 82): used as food. — **Tobacco** (**17**, p. 82): leaves smoked.

Savannah.

Chinkapin nuts (**25**, p. 53): used as food. — **Hickory nuts** (**25**, p. 53): used as food.

Sax and Fox.

Basswood bark (**29**, p. 126): twine obtained from it to bind rushes. — **Beans** (**29**, p. 126): used as food. — **Cane** (**14**, p. 43): flageolet made from it or of two pieces of soft wood hollowed out and fastened together by strips of leather. — **Corn** (**29**, p. 126): used as food. — **Gooseberries** (**14**, p. 29): used as food. — **Grapes** (**14**, p. 29): used as food. — **Melons** (**14**, p. 44): used as food. — **Nettle** (**29**, p. 126): twine obtained from the bark. — **Onions** (**4**, p. 534): used as food. — **Pecans** (**15**, p. 20): used as food. — **Plums** (**14**, p. 29): used as food. — **Potatoes** (**4**, p. 534): sweet and white potatoes used as food. — **Pumpkins** (**14**, p. 41): used as food. — **Rushes** (**29**, p. 126): mats made from. — **Sap pine**, *Kee-chi-he-ja-ka* (**22**, p. 419): a healing gum which the Sax and Fox always take with them when they travel.

Shawnee.

Apple, *meshemenake* (**2**, p. 291): used as food. — **Beans**, *misoochethake* (**2**, p. 291): used as food. — **Indian turnip**, *e-haw-sho-ga* (**22**, p. 413): used with spikenard and wild licorice. — **Maize** (**19**, p. 14): used as food. — **Melons**, *usketomake* (**2**, p. 291): used as food. — **Nuts**, *pacami* (**2**, p. 291): used as food. — **Onions**, *shekagosheke* (**2**, p. 291): used as food. — **Peaches** (**40**, p. 17): used as food. — **Peas** (**19**, p. 14): several kinds used as food. — **Potatoes**, *meashethake* (**2**, p. 291): used as food. — **Pumpkins**, *wabego* (**2**, p. 291): used as food. — **Squashes** (**40**, p. 17): used as food. — **Tobacco** (**40**, p. 57): leaves smoked. — **Wheat**, *cawasque* (**2**, p. 291): used as food.

IROQUOIAN FAMILY.

Iroquois. — Derivation: the adaptation of the Iroquois word *hiro*, used to conclude a speech, and *koné*, an exclamation. (Charlevoix.)

TRIBES REPRESENTED.

Cayuga	Mohawk	Seneca
Cherokee	Oneida	Tuscarora
Huron	Onondaga	Wyandot

Cayuga.

Buckwheat (**36**, p. 58): used as food. — **Corn** (**36**, p. 57): used as food. — **Oats** (**36**, p. 58): used as food. — **Potatoes** (**36**, p. 58): used as food. — **Wheat** (**36**, p. 58): used as food.

Cherokee.

Apples (**12**, p. 11): used as food. — **Beans** (**28**, p. 69): used as food. — **Beggar's lice** (**12**, p. 11): tea made of it to assist the memory "since it clings so well." — **Blackberries** (**12**, p. 11): used as food. — **Chestnut** (**28**, p. 69): a tuberous root used as food. — **China brier** (**23**, p. 34): roots used as a blood purifier. — **Cone flower** (**20**, p. 197): used as a wash for sore eyes. — **Grapes** (**5**, pp. 228–29): used as food. — **Hemp** (**5**, pp. 228–29): used for cords. — **Hoary pea**, *Tephrosia virginiana* (**12**, p. 11): an infusion of it used as a wash to strengthen the body. — **Hops** (**5**, pp. 228–29): used as food. — **Horehound** (**5**, p. 235): wild horehound used for snake bite. — **Lobelia**, *Lobelia cardinalis*, cardinal flower (**8**, p. 41): a decoction of the root used. *Lobelia syphilitica*, great lobelia (**23**, p. 34): a blood purifier. — **May apple**, *Podophyllum peltatum* (**23**, p. 34): used as medicine. — **Nettle**, *Jatropha ureus*, white nettle (**23**, p. 34): roots used as medicine. — **Nordica** (**23**, p. 34): the juice of its white root used as medicine, and its roots smoked. — **Oats** (**12**, p. 11): cultivated as food. — **Peaches** (**12**, p. 11): used as food. — **Plantain** (**5**, p. 235): wild plantain used for snake bite. — **Potatoes** (**12**, p. 11): used as food. — **Pumpkins** (**28**, p. 69): used as food. — **Purslane**, *Portulaca oleracea* (**20**, p. 197): used as medicine. — **Rye** (**12**, p. 11): cultivated as food. — **Sarsaparilla**, *Panax ginseng* (**23**, p. 34): used as medicine. **Sassafras** (**23**, p. 34): roots used as a blood purifier. — **Snakeroot** (**5**, p. 235): fern snakeroot carried in the shot pouch as a remedy for snake bite. — **Squashes** (**28**, p. 69): used as food. — **St. Andrew's cross** (**5**, p. 235): used for snake bite. — **Strawberries** (**12**, p. 11): used as food.

Huron.

Beans (**38**, p. 13): cultivated as food. — **Birch** (**13**, p. 73): white birch bark used to cover lodges. — **Blackberries** (**33**, p. 143): used as

food. — **Corn** (**33**, p. 168): used as food. — **Gooseberries** (**33**, p. 143): used as food. — **Grape** (**33**, p. 153): used as food. — **Hemp** (**38**, p. 13): fibre used for twine and cordage. — **Lichen** (**33**, p. 142): *tripe de roche*, boiled and used as food. — **Pumpkins**, or *citrulles* (**33**, p. 163): used as food. — **Squashes** (**38**, p. 13): cultivated as food. — **Tobacco** (**38**, p. 13): cultivated, leaves smoked. — **Wild rice** (**13**, p. 73): "the stalk is woven into mats for the walls of the lodges"; fruit used as food.

Mohawk.

Corn (**36**, p. 52): cultivated as food.

Oneida.

Corn (**36**, p. 43): cultivated as food.

Onondaga.

Apple, *swa-hu-na* (**10**, p. 115). — **Basswood**, *ho-ho-so* (**10**, p. 116): used to make fine strings and mats. — **Beans**, *oo-sah-ha-tah* (**10**, p. 119): used as food. — **Birch**, *ga-nah-jeh-kwa* (**10**, p. 116): used for canoes. — **Blackberry**, *sa-he-is* (**10**, p. 116): used as food. — **Butternut**, *ooo-ha-wat-tah* (**10**, p. 119): used as food. — **Cat-tail flag**, *oo-na-too-kwa* (**10**, p. 118): used for mats. — **Cherry**, *ja-e-goo-nah* (**10**, p. 114): wood used. — **Chestnuts**, *oheh-yah-tah* (**10**, p. 116): used as food. — **Chokecherry**, *ne-a-tah-tah-ne* (**10**, p. 114): used as food. — **Currant**, *ska-heus-skah-he* (**10**, p. 119): used as food. — **Flax**, *ooo-skah* (thread-like) (**10**, p. 117): used to make thread. — **Ginseng**, *da-kien-too-keh* (**10**, p. 115). — **Gooseberry**, *ska-heus-skah-he-goo-na* (**10**, p. 114): used as food. — **Grape**, *oh-heun-kwe-sa* (**10**, p. 114): wild grape, used as food; *oh-heun-kwe-so-goo-no*, cultivated grape, used as food. — **Hickory**, *a-nek*, a bitter nut. *us-teek* (**10**, p. 120). *Oo-sook-wah*, common variety of hickory. — **Huckleberry**, *o-heah-che* (**10**, p. 116): used as food. — **Lettuce**, *oo-na-tah-kah-te* (**10**, p. 115): eaten raw. — **Maize**, *oo-ne-hah* (**10**, p. 119): used as food. — **May apple**, *o-na-when-stah* (**10**, p. 115): used as food. — **Melon**, *wah-he-yah-yees* (**10**, p. 114): muskmelon, used as food. *Oo-neah-sa-kah-te* (**10**, p. 114): watermelon, used as food. — **Peaches**, *oo-goon-why-e* (**10**, p. 114): used as food. — **Pear**, *koon-de-soo-kwis* (**10**, p. 114): used as food. — **Peas**, *o-na-kwa* (**10**, p. 119): used as food. — **Peppermint**, *kah-nah-noos-tah* (**10**, p. 116). — **Plum**, *ka-ka-tak-ne* (**10**, p. 118): wild plum, used for food. — **Potato**, *oo-neh-noo-kwa* (**10**, p. 119): used as food. — **Raspberry**, *o-nah-joo-kwa* (**10**, p. 116): used as food. *Tew-tone hok-toon* (**10**, p. 116): black

raspberry, used as food. — **Rose**, *ah-weh-ha-tah-ke* (**10**, p. 118): wild rose, used as medicine. — **Sarsaparilla**, *ju-ke-ta-his* (**10**, p. 116). — **Snakeroot**, *o-skwen-e-tah* (**10**, p. 120). — **Squash**, *oo-neah-sah-oon-we* (**10**, p. 114): used as food. — **Strawberry**, *noon-tak-tek-hah-kwa* (**10**, p. 114): used as food. — **Sumac**, *oot-koo-tah* (**10**, p. 119): leaves smoked. — **Thimbleberry**, *o-nah-joo-kwa-goo-na* (**10**, p. 116): used as food. — **Tobacco**, *o-yen-kwa-hon-we*, *Nicotiana rustica* (**10**, p. 118): leaves smoked. — **Turnip**, *o-je-kwa* (**10**, p. 115): used as food. — **Wake-robin**, *o-je-gen-stah* (**10**, p. 117); white wake-robin; medicinal use not known to the Onondagas.

Seneca.

Apples (**37**, p. 18): used as food. — **Ash** (**34**, p. 49): used to make baskets. — **Basswood** (**37**, p. 20): leaves used. — **Beach plums** (**37**, p. 18): used as food. — **Beans** (**37**, p. 18): used as food. — **Black walnuts** (**37**, p. 18): used as food. — **Corn** (**37**, p. 18): used as food; husks used to make baskets (**34**, p. 49). — **Groundnuts** (**37**, p. 18): used as food. — **Hazelnuts** (**37**, p. 18): used as food. — **Hickory** (**34**, p. 49): snowshoes made from the wood. — **High-betony** (head-betony) (**37**, p. 20). — **Mandrakes** (**37**, p. 18): used as food. — **Maple** (**34**, p. 48): sugar made from the sap. — **Mulberries** (**37**, p. 18): used as food. — **Ooklthaw** (**37**, p. 18): a root used to make bread. — **Peaches** (**37**, p. 18): used as food. — **Potatoes** (**37**, p. 18): used as food. — **Rushes** (**34**, p. 49): used to make baskets. — **Squashes** (**37**, p. 18): used as food. — **Sumac** (**34**, p. 49): leaves mixed with tobacco. — **Tobacco** (**34**, p. 49): leaves smoked.

Tuscarora.

Beans (**36**, p. 69): used as food. — **Buckwheat** (**36**, p. 69): used as food. — **Corn** (**36**, p. 69): used as food. — **Oats** (**36**, p. 69): used as food. — **Peas** (**36**, p. 69): used as food. — **Potatoes** (**36**, p. 69): used as food. — **Turnips** (**36**, p. 69): used as food. — **Wheat** (**36**, p. 69): used as food.

Wyandot.

Beans, *yah-re-sah* (**2**, p. 294). — **Corn**, *nay-hah* (**2**, p. 294). — **Grass**, *e-ru-ta* (**2**, p. 294). — **Melons**, *o-nugh-sa* (**2**, p. 294). — **Potatoes**, *da-ween-dah* (**2**, p. 294). — **Pumpkins**, *o-nugh-sa* (**2**, p. 294). — **Weeds**, *ha-en-tan* (**2**, p. 294).

CAMBRIDGE, MASS., August 31, 1900.

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ON THE SYSTEMATIC POSITION OF THE SAND GROUSE (PTEROCLES; SYRRHAPTES).

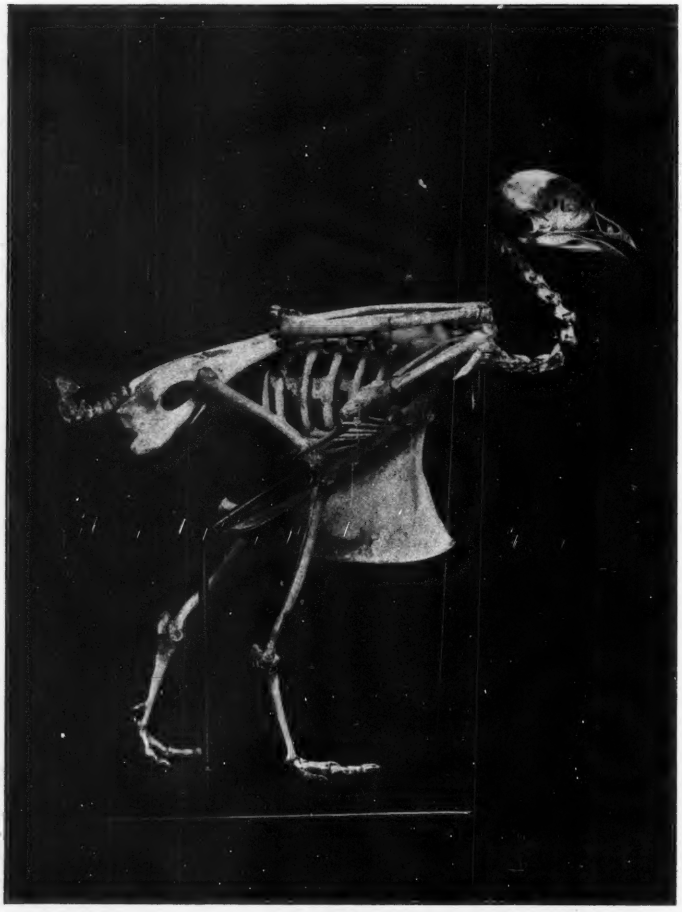
R. W. SHUFELDT.

THERE has been no question for many years past, in the minds of avian taxonomers, as to the general affinities of these birds. This opinion may be briefly stated by saying that the sand grouse constitute a small assemblage of forms, related on the one hand to the gallinaceous birds, and on the other to the pigeons.

Some authors have relegated them to a distinct group, placing it in their schemes of classification between the fowls and the Columbæ. Huxley created the Pteroclomorphæ for them, and Sclater, regarding them as a family, Pteroclidæ, placed them in the order Pterocletes, standing between the Columbæ and the Gallinæ, and in this he has been followed by Stejneger and others. Garrod, Fürbringer, and other authorities, again, have arrayed them with the pigeons. Numerous papers have been devoted to their osteology, but the best of these is doubtless the one given us years ago by William Kitchen Parker, in the *Transactions of the Zoölogical Society of London* (V, 149), where they are treated in his memoir entitled "On the Osteology of the Gallinaceous Birds and Tinamous." The plates to his memoir illustrate the skeleton of *Syrrhaptes paradoxus*, while in the text we have a more or less extensive comparison of the osseous system of this species with that of *Pterocles arenarius*. Parker's figures are very helpful, and in addition to them I have examined some bones of Syrrhaptes loaned me by Professor Alfred Newton, F.R.S., and there are also at hand the mounted skeleton (see plate) and disarticulated one of *Pterocles arenarius*, belonging to the collections of the United States National Museum, and other material.

One has but to glance at the skull of Pterocles to be satisfied that the bird is not a pigeon, while, on the other hand, it

brings to mind the skulls of some of the smaller grouse or ptarmigans. The cervico-dorsal region of the skeleton also is by no means truly columbine, though without difficulty we can



Skeleton of Sand Grouse (*Pterocles arenarius* Pallas). No. 18,849, Coll. U. S. Nat. Museum. Reduced about one-third.

see the pigeon in the pectoral limb, the sternum, the pelvis, the ribs perhaps; but to a less extent in the shoulder girdle and the bones of the pelvic extremities.

The form of the premaxillary is gallinaceous, the sutural traces of its proximal frontal process being distinct throughout life over the facial frontal region in the middle line, as we see it in many fowls. The large narial openings are elliptical in outline, and made even more so by a curled osseous extension upon either side of the inner nares, that is, above and in front of the very large pars plana, below and in front of the frontal, touching the nasal externally and the premaxillary internally, while its upper part, with its free anterior edge, is in full view upon superior aspect of the skull. A few small, irregular vacuities may occur in the interorbital septum, but the good-sized orbit has upon all sides well-defined bony walls, the frontal roof overhead being well produced, the pars plana large and concaved upon its posterior aspect, the anterior part of the brain-case complete; while quadrate, pterygoid, and palatine afford a fairly good osseous floor.

The postfrontal processes are more or less aborted, and the squamosal ones are thin and lamelliform, as in the chickens, — the two apophyses not coming in contact distally.

At the base of the skull the palatines are of extremely slender construction, and widely separated from each other in the middle line. They do not even come in contact across the sphenoidal rostrum, which latter is much thickened and rounded, being pointed anteriorly, where it is carried beyond the pars plana.

Either maxillo-palatine is a mere rudimentary spine, so small that the thread-like anterior rod of the corresponding palatine almost conceals it from view, when the skull is looked at from this side. A pterygoid is also very slender, and presents a somewhat flattened sigmoid curve at its middle part. These bones articulate with pteryapophysial processes at the cranium's base. No vomer seems to be present, and the nasal septum is but very imperfectly performed in bone.

The zygomatic arches are slender and straight, while the quadrates are well developed and present no very unusual characters.

The mandible, of a V-pattern, resembles to no small extent that bone in some of the smaller ptarmigans (Lagopus). A

good-sized ramal vacuity is present in either ramus, and the straight and blunt angular processes are considerably produced.

Kitchen Parker has said the "differences between the skull of *Pterocles arenarius* and *Syrrhaptes paradoxus* are not great, but are important. The head and face of the former are altogether stronger, more gallinaceous and less pigeon-like, than in the latter. The skull base has, in the Pterocles, that peculiar breadth which arises from the struthiousness of its structure. The upper frontal region is broader between the eyes, and the alæ of the ethmoid swell up to a greater extent between the crura of the nasal. The postorbital and squamosal processes are much stronger, and make a thicker bridge over the temporal fossa. The crossing of the posterior and horizontal semicircular canals project in the same hemispherical manner as in Syrrhaptes, and the tympanic ala of the lateral occipital is equally arrested."

"The molar arch is stronger, and the central interorbital space is filled up;[1] so also are the orbito-frontal fontanelles; the common optic foramen is more closely and neatly circumscribed. There is still an oval slit, opening into both orbits, between the ethmoid bar and the lower edge of the frontals at their coalescence. The antorbital lachrymal mass is equally large, and the septum nasi as well developed and as completely ossified.[2]

"The bones of the face generally are quite as strong as in ordinary pigeons, and therefore a degree beyond what is seen in Syrrhaptes. The double head of the os quadratum agrees with the same structure in Syrrhaptes, and there is nothing special to remark upon in the bones of the palatine region. The lower jaw is altogether stronger and deeper, its bend is more marked and further back, than in that of Syrrhaptes; the membranous space is of about the same size, as are also the angular processes."[3] There is an excellent account of the skull of Syrrhaptes, including the bones of the tongue, etc., in the work of Professor Parker just quoted. It is interesting to

[1] Not so in all specimens. — R. W. S.

[2] The septum narium does not always completely ossify in all individuals of this group; it may, however, do so in the skulls of very old specimens. — R. W. S.

[3] On the Osteology of Gallinaceous Birds and Tinamous (p. 204).

note that in Syrrhaptes there are sixteen cervical vertebræ; fifteen in *Pterocles arenaria;* and but fourteen in *Ectopistes migratorius.* Again, in Syrrhaptes, *three* of the dorsal vertebræ coössify into one piece, the fourth dorsal remaining free. This agrees with Ectopistes; while in *Pterocles arenarius, four* dorsals coössify to form a single piece, and posterior to this another free dorsal vertebra is found, making five. This, with many similar points in its skeleton, goes to show that Syrrhaptes is nearer the pigeons than is Pterocles; yet neither of these forms are truly columbaceous.

In the pelvis of either genus we find just such a bone as we should expect to find in birds that are doubtless typical intermediates, standing directly in their organization between two well-circumscribed groups. In the sand grouse, however, the lateral portions of the pelvic sacrum, at its widest part, fail to ossify, and thus, in the dried skeleton, leave large vacuities in that region not seen in tetraonine nor typical columbine birds.

There is usually one less *sacral* vertebra in pigeons than there is in the sand grouse, the former having fourteen, while Syrrhaptes and Pterocles have fifteen; and Parker claims that the last has but six vertebræ in its tail, and this is all I find in Ectopistes, while *Columba livia* and *Pterocles arenarius* each possess seven.

Professor Parker is correct when he says, "I do not set much value on the number of caudal vertebræ, as the last is a series, and the tail is very apt to vary in the number of those which shall be swallowed up in this terminal piece."

The epipleural processes on the ribs are much broader and deeper in *Pterocles arenarius* than they are in Ectopistes and other pigeons.[1]

In Pterocles the scapulæ are long, narrow, and tapering, reaching, in fact to some extent overreaching, the ilia of the pelvis posteriorly. In Ectopistes these bones are cimeter-

[1] In the autumn of 1899 Professor C. O. Whitman requested me to write out for him a complete account of all the species of the North American pigeons, in so far as their osteology was concerned, as a contribution to the *Journal of Morphology.* This I did, illustrating the memoir with several figures of the bones of the birds of that group, and a number of the points referred to in the present paper will therein be illustrated. It was accepted for publication and will in due course appear in the aforesaid journal, probably some time in 1901. — R. W. S.

shaped, and both dilated as well as truncated behind, where they do not reach the ilia by any means. Pterocles has a very insignificant fourchette in its shoulder girdle, slender and of a U-pattern. Its clavicular ends articulate with the scapulæ. This they fail to do in all the pigeons I have examined, where the bone has much the same form and slenderness, but reaches a great deal farther down towards the carinal angle of the sternum. As already stated above, both the sternum and the upper extremity of Pterocles are quite columbine in character, especially the former. Its sternum has considerably more pigeon than it has grouse in it, and as this bone is often seized upon by some avian classifiers as *the* index of a bird's systematic position and its affinities, it may account for the sand grouse having been placed upon the columbine side of the line in certain schemes of classification.

With a strong columbo-tetraonine tincture in it, the pelvic limb of *Pterocles arenarius* has characters in it not commonly, if ever, found in those allied groups. In *P. arenarius* (No. 18,849, Coll. U. S. Nat. Mus.) the first metatarsal coössifies with the tarso-metatarsus; is high up on the shaft; and the basal hallucial joint, with its unequal phalanx, is very rudimentary. There are but three joints and a claw in either outer podal digit; while the limb below the knee (there being no patella) is well supplied with sesamoids. One great grooved one is found back of the tibio-tarsal condyles, and two or three small ones in the sole of the curious foot of this bird. Air does not gain access into the shafts of the long bones of the pelvic limb of Pterocles; and this also holds true for Syrrhaptes (Parker).

As to the systematic position of the sand grouse, it may be briefly said that there is altogether too much grouse in the skull of Pterocles to admit of its being arrayed with the Columbæ; while, on the other hand, there is too much pigeon in both Pterocles and Syrrhaptes to admit of placing either of these genera in the tetraonine assemblage. The place they really hold is an intermediate one, and this is best shown, I think, and the ends of classification best served, by arraying them in a separate group, — the suborder Pterocles, standing between the Galli and the Columbæ.

CONTRIBUTIONS FROM THE ZOÖLOGICAL LABORATORY OF THE MUSEUM OF COMPARATIVE ZOÖLOGY AT HARVARD COLLEGE. E. L. MARK, DIRECTOR. No. 118.

CORRELATED ABNORMALITIES IN THE SCUTES AND BONY PLATES OF THE CARAPACE OF THE SCULPTURED TORTOISE.

G. H. PARKER.

A TYPICAL carapace of the sculptured tortoise (*Chelopus insculptus* LeC.) is composed of fifty bony plates, so united as to form a strong dorsal shield, and of thirty-eight horny scutes covering this shield externally. These elements are arranged as shown in Fig. 1, in which the black lines represent the limits of the bony plates, and the lighter ones those of the scutes. The scutes form three series: first, a median set, which, beginning at the anterior end and proceeding posteriorly, consists of a narrow nuchal scute, five large central scutes, and a pair of pygal scutes, one right and the other left; secondly, four pairs of large centro-lateral scutes,

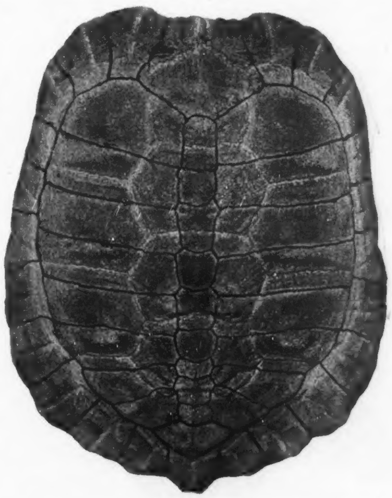


FIG. 1. — Dorsal view of a normal carapace of a male sculptured tortoise. The faint whitish lines represent the edges of the scutes, which were removed in making the preparation; the black lines mark the margins of the bony plates. × ⅔.

which flank the median series, except at the anterior and the posterior ends; and, thirdly, eleven pairs of marginal scutes,

which bound the periphery of the carapace, except where the nuchal and the pair of pygal scutes reach the edge. The bony plates (Fig. 1, black outlines) are also arranged in three series. The median one is composed of twelve plates, which, beginning at the anterior end, are, first, a large nuchal plate; next, eight neural plates; and, finally, three pygal plates, one behind the other. Eight pairs of costal plates abut with their central ends on the median series, and extend laterally well towards the edge of the carapace. Excepting where the nuchal plate and last pygal plate reach the edge, the carapace is bounded by eleven pairs of marginal plates. Although the scutes and bony plates are arranged upon similar plans, the two sets of elements do not coincide either in numbers or in exact positions.

The first abnormal specimen to be described is one (Museum, No. 1829) from the extensive series by which this species is represented in the collections of the Museum of Comparative Zoölogy at Harvard College, Cambridge. It is a male and was collected at Lancaster, Mass. My thanks are due Mr. Samuel Garman for having called my attention to it, as well as the authorities of the museum for their liberality in allowing me to dissect such parts as were needed. The carapace, which was about 15 cm. long and 11.3 cm. broad, had suffered somewhat from marginal fractures, but in no instance had a whole scute or plate been lost through such injuries.

FIG. 2. — Dorsal view of abnormal carapace No. 1 (Mus. Comp. Zoöl., No. 1829). The black lines give the outlines of the scutes. × ½.

The arrangement of the scutes is given in Fig. 2, an examination of which shows that there are two abnormal regions:

first, the middle and posterior parts of the median series; and, secondly, the anterior parts of the marginal series.

In the median series the nuchal and first central scutes are essentially normal. The second central is irregular on its posterior margin; the third and fourth centrals are apparently each divided in two by nearly parallel oblique lines; and the fifth central is irregular anteriorly. The second, third, and fourth centro-laterals of the right side are also irregular in form. To the right of the fifth central is a small supernumerary scute, which may represent a part of any one of the surrounding elements except the marginals. These are apparently not involved in the irregularity, whose center obviously lies to the right of the median line in the region of the third and fourth centrals.

FIG. 3. — Dorsal view of abnormal carapace No. 1. The black lines give the outlines of the bony plates. × ½.

When the bony plates underlying the region of irregularity just described are inspected (Fig. 3) they are seen to present no features essentially different from the normal arrangement, and it is, therefore, clear that in this region the abnormalities are limited to the scutes and are not associated with any peculiarities of the underlying bony plates.

The second abnormal region in this carapace lies anteriorly and is easily recognized by peculiarities in the marginal scutes (Fig. 2). If the lines of separation between the first and second centro-lateral scutes of both sides are traced laterally, they will be found to be continuous with lines between marginal scutes. These intermarginal lines are undoubtedly a

natural pair, because posterior to each there are seven marginals and one pygal — a condition which is identical with that in the normal carapace (compare Fig. 1). Anterior to these lines, however, the right and left sides of the carapace are different; on the right side are three marginals, on the left four. As the left side has the normal number of marginal scutes, the abnormality may be described as a deficiency on the right side, an interpretation that is supported by the fact that the outline of this side recedes more than is usual in this species (compare Figs. 1 and 2). Since the right side is normal from the fourth intermarginal line posteriorly, the deficiency may with fairness be said to lie in the region covered in this specimen by the first three marginals.

FIG. 4. — Dorsal view of abnormal carapace No. 2. The black lines are the outlines of the bony plates. × ½.

An examination of the bony plates in the marginal series of this carapace (Fig. 3) shows a condition substantially like that just described. The first four marginal plates of the left side occupy a region which corresponds to that covered by the first three marginals of the right. The total number of marginal plates on the left side is eleven, and this side may be described as essentially normal, notwithstanding the fact that the first marginal is triangular instead of quadrilateral. The total number of marginals on the right side is ten, and the deficiency, as can be seen by a comparison with a normal specimen (Fig. 1), lies in the region covered by the first three plates. As this is the region from which a scute is absent, the conclusion is warranted that, in this instance, the absence of a

bony plate is accompanied by the absence of an overlying scute. Thus the first specimen illustrates two conditions: scute abnormalities *unassociated* with bony abnormalities, as seen in the median and right centro-lateral parts; and scute abnormalities *correlated* with bony abnormalities, as seen in the anterior portion of the right marginal series.

The second abnormal carapace was brought to my attention by Mr. C. E. Preston, to whom the specimen had been assigned for study, and who kindly prepared it for me. The animal was a male and came in all probability from Maryland. Its carapace, when prepared, measured about 15.7 cm. in length and 12.1 cm. in breadth.

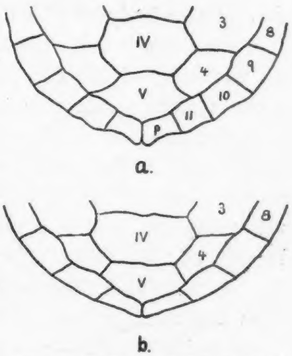


FIG. 5. — Outlines of the scutes on the posterior part of the carapace of (*a*) a normal sculptured tortoise and of (*b*) the abnormal tortoise No. 2. 3, 4, third and fourth right centro-lateral scutes; 8, 9, 10, eighth, ninth, and tenth right marginal scutes; *p*, right pygal scute; IV, V, fourth and fifth central scutes.

At first sight the carapace (Fig. 4) does not seem to be abnormal, but a closer inspection shows that there must be at least two abnormal regions, one in the scutes and the other in the bony plates; in both instances the abnormalities form symmetrical areas. The scute abnormalities occur in the posterior part of the marginal series. On both sides marginals 1 to 8 are entirely normal. In typical specimens (Fig. 5, *a*) marginal 8 is followed on either side by four scutes, — marginals 9, 10, 11, and the pygal scute. In the abnormal specimen (Fig. 5, *b*), in place of these four scutes, only three are present. As it is impossible to state which scute of the four is absent, the condition may be described as a bilateral deficiency of one scute posterior to marginal 8.

The bony plates of this specimen in the regions where scute abnormalities occur are essentially normal (Fig. 4), and the same may be said of those at the anterior end of the carapace. In fact, judging from the number and shapes of the plates, normal conditions may be said to exist between the anterior edge of the carapace and the transverse line marked by the

posterior borders of the first costal plates, and between the posterior edge of the carapace and the transverse line marked by the anterior borders of the next to the last pair of costal plates. The rest of the carapace is made up of four bony segments instead of the five which are typical of normal individuals (Fig. 1). In this abnormal specimen, therefore, a whole bony segment (a neural plate, a pair of costals, and a pair of marginals) is absent, and the position of the deficiency is somewhere between the posterior edge of the first pair of costals and the anterior edge of the next to the last pair of costals, *i.e.*, in the body of the carapace.

Such a suppression might be expected to be accompanied by a shortening of the carapace, and, as a matter of fact, there is some evidence that this is so. The length of the carapace under consideration is 15.7 cm., its breadth 12.1 cm.; the length is, therefore, 1.298– times the breadth. In ten normal males taken at random the average length of their carapaces was 16.65 cm., and the average breadth 12.68 cm.; the average length was therefore 1.313 + times the average breadth. It thus appears that the abnormal specimen is somewhat shorter than the average normal specimen, both absolutely and relatively to its length, — a condition to be expected if the suppression of a segment is assumed.

Although the second specimen shows abnormal conditions in both scutes and bony plates, the fact that the two abnormal regions do not overlap even in part (for the most posterior position assignable to the bony-plate abnormality is still anterior to the most anterior position assumable for the scute abnormality) might well lead to the inference that these two irregularities were in no true sense correlated. Such a conclusion, however, is probably incorrect. The fact that neither of the two abnormalities interferes with bilateral symmetry at least suggests something more than an accidental relation, though it in no wise meets the objection that the abnormalities are not superimposed. This objection, however, is not as serious as at first sight it seems to be. Harrison ('98) some time ago showed by a series of ingenious experiments on young tadpoles that in the growth of the posterior parts of

their bodies the germ layers undergo a curious change in position. The tail of a developing tadpole is composed of an outer covering of ectoderm — which ultimately gives rise to the outer layers of the skin — and of a core of mesoderm. These two masses of tissue grow in very different ways, so that as the tail lengthens the ectodermic covering, which is most actively produced anteriorly, slips posteriorly over the underlying mesoderm, whose region of growth is chiefly at the posterior end. Although this posterior migration of the ectoderm has been actually demonstrated only in the tadpole, there is reason to believe that it occurs in other vertebrates. Admitting its existence in the turtle, it affords an easy means of explaining the conditions described. The scutes of turtles are derived from the ectoderm, the bony plates from the mesoderm. In the anterior part of the carapace these ectodermic and mesodermic derivatives, according to the peculiarity of growth just explained, would not undergo any separation but would retain their embryonic positions. Hence, if the material from which both scutes and plates arise were modified by any local influence, the resultant scutes and plates would be found together, as in the first abnormal specimen described. In the posterior part of the carapace, on the other hand, the ectodermic migration would be excessive and any early local disturbing influence that affected both scute and plate-producing tissue would leave its trace in the adult in the form of a region of modified scutes posterior to a region of modified bony plates, — a condition realized in the second abnormal specimen. Thus, from what is known of the methods of growth of the integument and subjacent parts in vertebrates, it is fair to assume that the abnormalities of scutes and bony plates in the second specimen, though separated in the adult, may be as truly correlated as those of the first specimen, in which the modified areas still remain superimposed.

The older anatomists have very generally pointed out the superficial resemblances between the scutes and the bony plates of the chelonian carapace, but they have as a rule denied any close relation between these two sets of structures. Gegenbaur ('98, pp. 132, 174), in his recently published volume

on the comparative anatomy of vertebrates, repeatedly emphasizes the idea of the independence of scutes and bony plates. The conclusions to which the present studies lead do not favor this view, but lend support to the opinion expressed in cautious terms by Goette ('99, p. 430), and more radically by Gadow ('99), to the effect that in primitive turtles each bony plate was associated with a single scute. Supposing such relations to have existed, it is easy to conceive how the present conditions could have been brought about; for, if the migration of the ectoderm were to be so retarded as to take place after its division into scutes, the posterior scutes would be carried away from the bony plates to which they belonged, and in consequence of crowding some of them might be suppressed, with the result that a carapace with a given number of bony plates would be covered by a smaller number of scutes. Although such an explanation of the present condition of the chelonian carapace must be tested by experiment, the evidence derived from the study of the abnormal specimens described above shows that there is a closer relation between bony plates and scutes than has been generally admitted heretofore.

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THREE POLYMELOUS FROGS.

ROSWELL H. JOHNSON.

Having found three undescribed polymelous frogs in different American museums, it occurred to me that the newly discovered method of skiagraphy might give an opportunity for the study of these cases without dissection, which is usually not permissible with museum abnormalities. The accompanying plates give the result of that work.

Case I (Figs. 1, 5, 6, and 7), a *Rana palmipes*, which had not yet lost its tail, is from the collection of the Harvard Medical School. This specimen bears two supernumerary limbs arising from the right and left scapular regions. Of these the one on the left is inferior in size to the normal leg of that side and is entirely free from it. It is peculiarly devoid of pigment. In the skiagraph (Fig. 5) a small rod-shaped bone, answering to a clavicle or coracoid, is to be seen extending from the head of the humerus of the supernumerary leg on the left to the skull. The humerus extends past its joint with the radio-ulna in a cartilaginous projection. The formation of the hand is apparently normal. The ulnar side is the more ventral and anterior. The supernumerary leg of the right side is represented by a mere stump, as some previous investigator has cut off most of the limb. This arises from the scapula, which is enlarged and misplaced on this side.

Case II (Figs. 3, 4, 8, and 9) is a young *Rana halecina* Dum. and Bibr., which was collected by Mr. Carlos E. Cummings on vacant land in the city of Buffalo. It is now loaned to the Buffalo Society of Natural Sciences. Directly above the left hind leg arises a supernumerary leg with nearly normal markings. In size this is but slightly less than the normal legs, the reduction being greatest in the phalanges. The head of the extra leg does not fit into an acetabulum, although it lies close to the position where its acetabulum would be. The left ilium

divides about one-third of the distance from the anterior end. The normal leg of the left side is connected with the more ventral and mesal of the two parts, as would be natural from its position. The dorsal part is apparently free from the pubis. The distal extremity of the tibio-fibula appears to have three terminal enlargements instead of the normal two. Three bones of about the same size replace the normal astragalus and calcaneum. Eight bony elements align themselves in the position of the metatarsals, one group of six, with two very much smaller ones at some distance. Three phalanges arise from the terminal metatarsal of the more strongly developed end and one from the next metatarsal. This structure certainly bears out Bateson's statement : "In the enormous majority of polymelians the extra repetition consists of parts of a complementary pair."

Case III (Figs. 2, 10, 11, 12) is another young *Rana halecina* Dum. and Bibr., in the anatomical collection of the University of Chicago, which from an accompanying note seems likely to have been found in the immediate vicinity. The coloration of the body is somewhat abnormal, in that the spots are smaller and more numerous than is usual. Directly ventral to the right fore leg, which is slightly displaced dorsally, and is smaller than the normal leg of the other side, is a peduncle from which two legs arise. These are each about the size of the left normal leg and distinctly larger than the normal leg of the right side. Each of the supernumerary legs seems normal in its parts and has the usual blotches. The ulnar aspects face each other. The skiagraph reveals two fused bones in the cone-shaped projection (indicated by asterisk) between the supernumerary legs. It seems to me that we must regard each of the halves of the outgrowth as again double, the internal member of each pair having developed from pressure and juxtaposition into these two fused bones in the cone-shaped projection. This seems likely from the analogy in abnormalities of crustacean appendages, such as that shown in Fig. 182, IV, in Bateson's *Materials for the Study of Variation*, which is taken from Maggi. In the cases cited of duplicity of appendages already of a double nature, the two median elements fuse

and remain comparatively undeveloped. Should my interpretation be correct, we have in this frog a hitherto undescribed degree of polymely.

I wish to express my thanks to Dr. C. B. Davenport, under whom this work was done.

HULL ZOÖLOGICAL LABORATORY,
February 17, 1900.

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PLATE I.

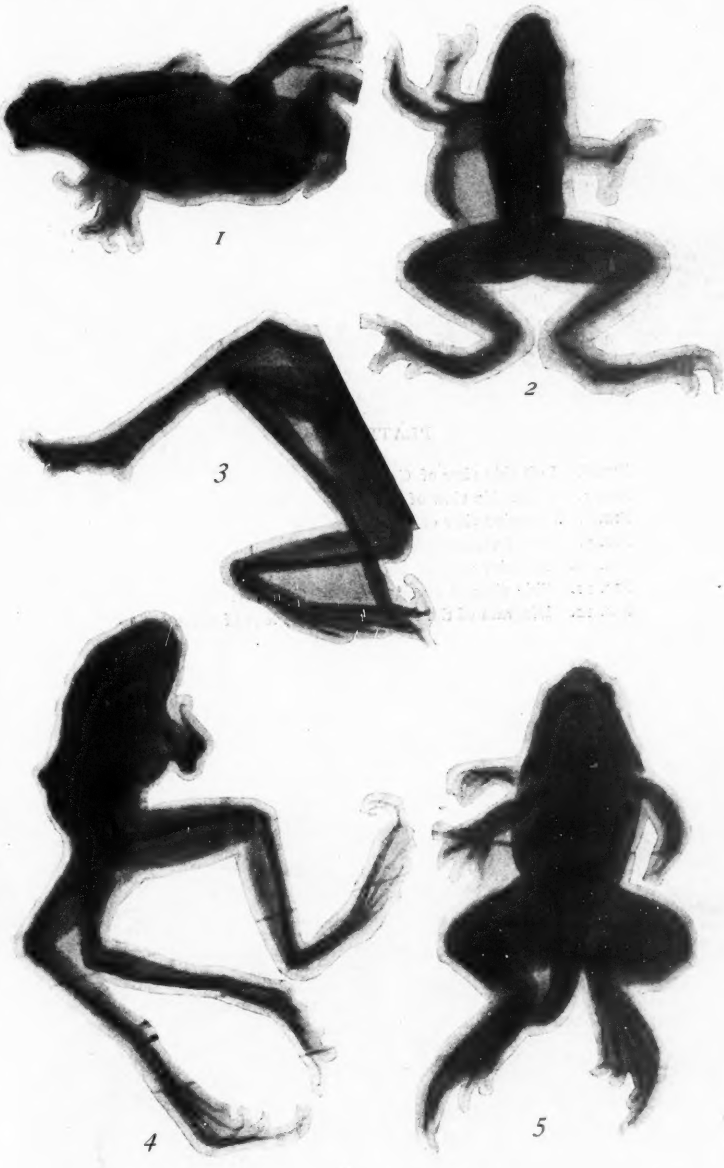
FIG. 1. Case I. Skiagraph taken with the frog's left side bearing the entire supernumerary leg closer to the plate.

FIG. 2. Case III. Ventral side closer to the plate, and legs so arranged as to be as much as possible in a transverse plane to the direction of the rays.

FIG. 3. Hind legs of Case II arranged to show the bony elements of the supernumerary leg.

FIG. 4. Case II. Dorsal side of pelvis closest to the plate. Anterior portion of the body projected far above the plate.

FIG. 5. Case I. Back closer to plate. Plate and frog were inclined to the course of the rays, so that image of the supernumerary leg would fall anterior to the normal legs.



1 2 3 4 5

PLATE II.

FIG. 6. Left side view of Case I.
FIG. 7. Right side view of Case I.
FIG. 8. Posterior view of Case II.
FIG. 9. Dorsal view of Case II.
FIG. 10. Anterior view of Case III.
FIG. 11. Side view of anterior part of Case III.
FIG. 12. Diagram of the toes of the extra legs of Case III.

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SOME CASES OF SALTATORY VARIATION.

CARL H. EIGENMANN AND ULYSSES O. COX.[1]

SOME specimens showing saltatory variation have been collected at various times for the museum of the Indiana University. It is the purpose of the present paper to place these on record.

1. A remarkable case of meristic abnormality was collected near Harrodsburg, Ind. The specimen is a male of the common frog, *Rana pipiens* Schreber, 54 mm. long, and shows the following characters (Fig. 1):

The forearm and hand of the right side are duplicated. The extra part arises just behind the normal arm and passes inward and forward to below the eye of the left side. It is 19 mm. long from its origin to the base of the fourth finger and 2 mm. in diameter. The normal right forearm is 12 mm. long and 5 mm. thick. Its striking and unique feature is the band of skin through which it passes, and which holds it as a sling. This band is well represented by the photograph, and is 4 mm. wide. The supplementary arm and wrist are so placed that the fourth finger occupies the posterior place. The second, third, and fourth fingers are as in the normal hand, but more slender. Separated from these there are, in the place of the first finger, two fingers, of which the first is the longer. The free portions of the five fingers measure respectively 4, 2, 3½, 5, and 3 mm. On the anterior margin of the base of the first finger there is a broad callosity.

On the lower surface of the lower jaw, below the left eye, there are two tubercles, the posterior one the longer, measuring 1½ mm. in height. There are no other indications of abnormalities.

The variation here recorded may be classed with pathological abnormalities rather than with variations that lead to the mutation of species.

[1] *Contributions from the Zoölogical Laboratory of the Indiana University*, No. 38.

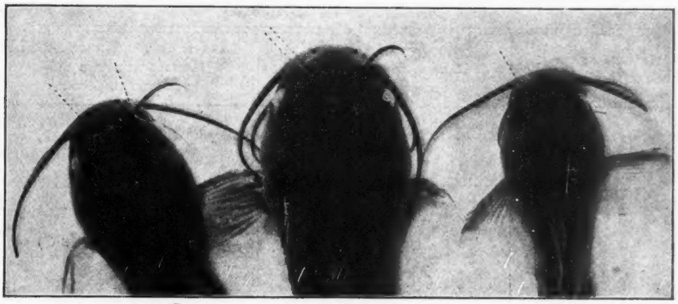
2. The second case is of much greater interest. It is a specimen of *Ameiurus natalis*, 120 mm. long, from Turkey Lake, Ind. It differs from normal specimens in the absence of all traces of ventral fins. There are no scars to indicate

FIG. 1. — Ventral view of *Rana pipiens*, with supplementary arm.

that the fins might have been lost as the result of a wound, and we may safely assume that in this specimen we have a case of saltatory variation which is perfectly bilateral. Such a variant, if its characters should be slightly prepotent, would give rise to a race of individuals without ventral fins, which, in nature, would readily be recognized by naturalists as a distinct

genus. It is possible that some of the genera of fishes without ventrals have arisen from such prepotent variants, a supposition that is reinforced by the following case of variation.

3. The variation of greatest importance to be recorded here was found in nine specimens of *Ameiurus melas*. These were collected at random, out of a lot that must have numbered fifty or more, in a small cave at Glasgow, Ky. The fact that the specimens showed a remarkable series of variations was not detected until after they had been brought to the laboratory, so we can safely assume that they were collected at random and not with respect to the variations to be recorded. The



B A C

FIG. 2.—*Ameiurus melas*, showing supplementary narial barbels (see directive lines).

specimens seen in the cave were all of approximately the size of the individuals here recorded. Unless they represent a dwarf race living in the small brook in this cave, they are probably of the same age. One of us visited this cave two years ago, and he neither remembers to have seen any catfishes in the cave stream at that time, nor are any specimens in the collection made at that time. While the fact that he does not remember to have seen them and did not collect any two years ago is not conclusive evidence that there were no catfishes in the cave at that time, the size of the specimens, taken together with this, makes it probable that the present specimens are under two years old and got into the cave either as a batch of eggs or during their schooling stage. It is well known that the young of the catfishes remain together as a school for

many days after hatching. It is not probable that they migrated into the cave as separate individuals, unless they came from a source as limited in extent as the cave itself. Specimens migrating from a more extensive source would, under no probability, show the similarity of variation to be here recorded.

In common with all the other North American fresh-water catfishes, *Ameiurus melas* is provided with a barbel in front of each posterior nasal opening. In the specimens under consideration there are usually one or more additional barbels behind the first, frequently on the anterior lip of the nasal opening. These barbels in detail are as follows, all measurements being in millimeters[1]:

NUMBER OF SPECIMENS.	LENGTH.	LENGTH OF THE LEFT NASAL BARBELS AND THE SUPPLEMENTAL ONES.	LENGTH OF THE RIGHT NASAL BARBELS AND THE SUPPLEMENTAL ONES.
1	110	$\frac{2-4^{a}}{1}$, **15**, 6	**16**, 1[b] (Fig. 2 *A*)
2	86	$\frac{4-4^{c}}{1}$, **12**	**11**, 7.9 (Fig. 2 *B*)
3	78	**11**[d]	**11**, 2
4	78	**11**, 6	**11**, 4 (Fig. 2 *C*)
5	78	**11** and small lobe	6, **10**, 2
6	76	**11**, $\frac{2\frac{1}{2}-2^{e}}{1}$	**11**
7	74	minute, **11**, 3	minute, **11**, $1\frac{1}{2}$
8	74	**10**, minute	**10**, lobe on narial lip
9	78	**11**, 1	**10**, 1

[a] On the left side there are two supplemental barbels. One behind the inner edge of the main barbel is 6 mm. long. One behind the outer edge is T-shaped. The basal segment is but 1 mm. long. The upper segment slants from behind upward and forward. Behind the basal segment it is 2 mm. long, the portion in front 4 mm.

[b] Placed on the edge of the narial lip.

[c] The supplemental barbel is Y-shaped, with the basal segment 1 mm. long, the distal segments each 4 mm., and placed on the edge of the narial lip.

[d] Here there are two lobes on the narial margin, but no distinct development of barbels.

[e] Y-shaped, with a basal segment 1 mm. long, and distal segments respectively $2\frac{1}{2}$ and 2 mm.

[1] In the columns of lengths the figures representing the lengths of the various supplemental barbels are placed in the same relation to the length of the main barbel as the supplemental barbels are placed to the principal barbel.

The length of the normal barbel is indicated in the table by heavy figures.

Summarizing these data, we get the following:

Number of cases with two barbels: left, 3; right, 2.
Number of cases with one barbel: left, 6; right, 7.
Number of cases with a Y or T shaped barbel: left, 3; right, 0.
Number of cases with no supplemental barbel: left, 0; right, 1.
Number of cases with one on the left and none on the right, 1.
Number of cases with one barbel on each side, 4.
Number of cases with two barbels on each side, 1.
Number of cases with two barbels on the left and one on the right, 2.
Number of cases with one barbel on the left and two on the right, 1.

Total length of all supplemental barbels, not counting minute lobes, ΣV: left, $37\frac{1}{2}$; right, $24\frac{1}{2}$.

Average variation, $\frac{\Sigma V}{N}$: left, 4.166; right, 2.722.

While it is difficult from the variety of elements (number, length, shape) that enter into each variation to make a direct estimate of the degree of variability of each side and the degree of correlation of the variation of the two sides, the number of individuals is so small that an approximation can be arrived at by a glance at the data.

The left side is much more variable than the right.

The presence of barbels on the two sides is an indication of bilateral correlation. This is reinforced by the fact that in five out of nine cases the number of barbels on the two sides is the same. It would seem that the left side is leading in the addition of barbels, in spite of the fact that in one specimen no supplementary barbel is found on this side.

Admitting, in the absence of evidence to the contrary and strong probability in its favor, that the specimens belong to one brood, or, at the very least, that the specimens occupying the narrow limit of environment in which they are found are

genetically related, we may deduce some interesting conclusions from the preceding data:

1. The variation here recorded is saltatory.
2. It is bilateral, without reaching perfect bilateral correlation. This makes it probable that primarily the variation was introduced or induced by changes on one side. Judging from its greater variability, the left side was primarily concerned.
3. It is improbable that the variation originated independently in each of the specimens.
4. The variation probably arose in one of the ancestors of the specimens.
5. Admitting 4, the saltatory variation arising in an ancestor was prepotent to a very high degree.

There are entirely too many probabilities in these conclusions, in spite of the fact that the probabilities all verge nearer certainty than uncertainty. The matter of the prepotency of the variation can readily be determined by breeding some specimens from the cave with normal specimens, which will be attempted.

THE LARVAL COIL OF BACULITES.

JAMES PERRIN SMITH.

Historical. — The genus Baculites is widely distributed in Cretaceous rocks, found in almost every region, and the straight shafts of this form are locally among the commonest fossils. But in nearly all these places only the straight, incomplete specimens are found; so that until a few years ago Baculites was supposed to be an ammonite that had reverted to the orthoceran form. About ten years ago, however, Dr. Amos Brown discovered in the Cretaceous beds of Dakota a number of young specimens of *Baculites compressus*, with a larval coil attached to the straight shaft; this he rightly interpreted as indicating the descent of Baculites from a coiled ancestor.

Until recently the larval coil of Baculites had been found only at this single locality near Deadwood, Dakota; but during the past year the writer discovered a number of larval coils of *Baculites chicoensis* Trask in the lower Chico beds, Upper Cretaceous, on the Arroyo del Vallé, about eight miles southeast of Livermore, Alameda County, California. Many of the specimens are perfectly preserved, some with the shell on and others in clear, transparent calcite casts, showing the development and the specific characters as well as when the animal was alive. In order that the early stages of the shell should be preserved the animal must have died in early youth, for the test is too thin and delicate to have remained uninjured while attached to the larger shell, and not protected by it. All specimens more than a few millimeters in length are found with the small end broken off, as it could not have been of any use to the animal.

A peculiarly fine sediment is necessary for the preservation of these fragile forms, and they were found only in calcareous nodules, where the amount of lime in the clay prevented the dissolving of the calcite of the shells, and where rapid hardening

prevented their decaying or being ground up by the waves. The young must have flocked together in quiet nooks where the water was clear and where there was little grinding by wave action on sands or pebbles. Such concurrence of circumstances must necessarily be seldom found, and it is not surprising that these delicate forms have been found in only two localities in the world.

Retardation in Baculites. — This genus has always been taken as a type of reversionary forms, since, although it descended from coiled ancestors, at maturity it resembles Orthoceras in its straight shell. It is, however, not really reversionary, for the septa are not orthoceran, nor even nautilian; they are ammonitic and complex, and grow more so towards maturity, after passing through a goniatite stage in early youth. The shell cannot, then, be said to have reverted to the stage of Orthoceras nor even of Bactrites; but it is clearly a degenerate, retrogressive form, retarded in most characters, while progressive in others. Its septa fail to reach the degree of complexity attained by its not very remote ancestors; the number of lobes and saddles is reduced, and the goniatite stage is prolonged, the ammonitic stage being reached later in life than was the case with its immediate ancestors.

But even this reduction of the elements of the septa responds to the law of tachygenesis and is pushed back in the ontogeny, so that in the earliest larval stages the full number of lobes and saddles is never present. Also the early straightening out of the spiral coil is progressive degeneration from a lytoceran form. In the genus Lytoceras it has often been observed that in old age the body chamber leaves the spiral a little way, and Baculites is merely a case of inherited senile degeneration, pushed back in individual ontogeny until the retrogressive characters appear at successively earlier stages of growth, reaching finally the larval stages. This is necessarily followed shortly by the extinction of the race.

In all normal ammonites the siphuncle begins in the embryonic protoconch with a cæcum or bulbous enlargement, which never appears in later stages. Baculites shows retardation in its development by a repetition of the siphonal cæcum in several

chambers of the larval coil, indicating a persistence of embryonic characters. This persistence of the siphonal cæcum is seen in the young of *Lytoceras alamedense*[1] from the same locality, and it is interesting to note that this species of Lytoceras shows degeneration also in the development of its septa; the genus normally has its lobes triænidian (three-pointed) in the early adolescent stages, while at maturity they always become dicranidian (divided into two sections); but *L. alamedense* never has triænidian lobes, they being dicranidian at the beginning of the adolescent stage. In Lytoceras we have an early inheritance of a mature character, and in Baculites a similar prematurity of development, but accompanied by greater retardation. In *Lytoceras alamedense* the septa become ammonitic at one and five-twelfths coils, diameter 1.87 mm., while in *Baculites chicoensis* the septa persist in the goniatite stage until the shaft has extended two and a half millimeters from the larval coil, corresponding to nearly two revolutions if the shell had been coiled continuously in a spiral.

Another mark of retrogression is the contraction of the whorl in the latter part of the larval coil; in the early stages the whorl increases normally in size, but at about three-fourths of a revolution begins to contract, until where the shaft leaves the coil it is much more slender than the embryonic or earlier larval whorl, and does not attain its former size until it has grown some distance beyond the coil. Contraction or abnormal shape of later whorls in ammonites has been shown by J. F. Pompeckj[2] to be a manifestation of degeneration, and to be accompanied by an early extinction of the race. In Baculites we find the contraction of the chamber pushed back by tachygenesis into the larval stage, and a profound degeneration otherwise shown; from the geological history of the race we know that its life was short and that extinction speedily followed upon this unnatural development of the shell.

Ontogeny of Baculites. — At maturity *Baculites chicoensis* consists of a straight shaft, slightly tapering, with an ovoid

[1] Smith, J. P. *Proc. Cal. Acad. Sci.*, third series, Geology, vol. i, No. 4, Pl. XVI, Fig. 5.

[2] *Die Ammonoideen mit Anormaler Wohnkammer.* 1894.

cross-section. The surface is corrugated with wrinkles or curved ribs parallel with the striæ of growth, forming a ventral, shovel-like extension of the aperture. The septa are complex, consisting of a divided ventral lobe, two pairs of laterals, and a short dorsal lobe. These resemble the septa of Lytoceras, but are simpler in digitation and number of lobes and saddles. Specimens of the mature shell are known nearly a foot in length, with scarcely any tapering of the form, so that the extreme size of maturity or old age must have been considerably greater than this.

The phylembryonic or protoconch stage is very much like that of all the other angustisellate ammonites, except that the spheroid tends to become more angular, and the internal septum begins to show traces of lobes and saddles. The siphonal cæcum is unusually large, and was seen to be within that part of the protoconch cut off by the first septum. The limits of the embryonic body chamber were plainly seen on several specimens, marked by a constriction between the first and second septa, but not following the outline of either; the diameter at this stage was 0.53 mm. (Fig. 5).

The next step in growth was the formation of the cæcum, followed very soon by the development of the first septum; this marks the beginning of the larval stage, as shown in Figs. 3 and 5. The body chamber of the first or ananepionic larval stage consisted of an entire revolution; thus the metamorphosis of the young animal must have been considerable. The surface of the shell in the phylembryonic and ananepionic stages was covered with pustules, giving a granulated appearance to it; but at the end of the first revolution these pustules ceased sharply at a constriction, and gave place to cross striæ and ribs (Figs. 12 and 18).

The second septum, which marks the beginning of the metanepionic stage, has a divided ventral lobe, and the full number of lobes and saddles that the animal possessed throughout life; the later changes consisted merely in the gradually increasing digitation of the septa, which, however, persisted in the goniatite stage not only throughout the entire coil, but also for two and a half millimeters of the straight shaft (Fig. 6).

The metanepionic or second larval stage is characterized by the sudden change in sculpture which takes place at the end of the first revolution, where the pustules are replaced by fine cross striæ and ribs parallel with these (Fig. 18). This stage may be arbitrarily considered to last as long as the coil continues, but the spiral widens and at a quarter of a revolution beyond the constriction the shell leaves the coil and grows out nearly straight. With this the paranepionic stage may be considered to begin, and to continue so long as the septa are goniatitic; at the distance of two and a half millimeters from the coil the septa begin to become ammonitic, and the larval stage ends (Figs. 19 and 20). The impressed zone continues in the shaft for nearly a millimeter from the coil, but before the paranepionic stage has ended the cross-section of the shaft becomes rounded instead of semilunular. The larval shell seems to be always unsymmetric, at least in the large number of specimens studied, and this lack of bilateral symmetry was not due to crushing, but actually to one-sided growth. The writer has observed that this is quite common in degenerate forms of ammonoids, while progressive species with normally healthy growth are exceedingly symmetric and constant in development.

The digitation of the septa, which begins with the indentation of the first lateral saddle at about two and a half millimeters from the coil, marks the beginning of the adolescent or neanic stage. The complexity of the septa increases slowly at first, but soon becomes more rapid as the whorl begins to be compressed laterally, which takes place at about eighteen millimeters from the coil. This lateral compression may be regarded as the beginning of the metaneanic or second adolescent stage, which, however, cannot be sharply differentiated from the others. The angle of increase of size of the whorl throughout the later larval and earlier adolescent stages is considerable, but at the distance of about thirty millimeters from the coil the angle becomes smaller, indicating a distinct change in the rate of growth. This may be called the last adolescent or paraneanic stage, and forms a gradual transition to mature conditions of growth. No sharp line of demarcation exists,

but for convenience the adult or ephebic stage may be said to have begun when the compressed form, the greatest complexity of septa, and the rough sculpture of maturity are visible. This is the case at the distance of about seven centimeters from the larval coil, when the animal has by no means attained to mature size. Further growth is then only increase in size and not progression of development. Old age, or the gerontic stage, shows itself in the obsolescence of sculpture and of the increase in size. Only a few specimens showing senile degeneration were found, which is not surprising if we consider the small chance any of the lower animals have of becoming old.

Phylogeny of Baculites. — This genus has usually been classed as an aberrant form under the Lytoceratidæ, but E. Haug[1] says that the resemblance of the adult septa of Baculites to those of Lytoceras is accidental; that Lytoceras in youth always has triænidian (three-pointed) septa, while Baculites is always dicranidian (two-pointed). But the writer[2] has recently described the development of a somewhat degenerate species of Lytoceras, in which the septa are two-pointed in the earliest adolescent stage. This observation removes the objection to the commonly accepted derivation of Baculites, and is especially interesting in view of the fact that Lytoceras in its old age often leaves the coil a little way. The young stages of the species of Lytoceras studied by the writer are almost exactly like those of *Baculites chicoensis*, the latter showing only a greater contraction of the larval chamber, a premature ornamentation of the embryonic and larval shell, and a reduction of the number of lobes and saddles. The only other studies on the development of this genus have been made by Dr. Amos P. Brown[3] on *Baculites compressus*. As compared with that species, *Baculites chicoensis* shows greater degeneration, for it leaves the spiral at the end of one revolution, while

[1] Les Ammonites du Permien et du Trias, *Bull. Soc. Géol. France*, 3e sér., vol. xxii, p. 410, 1894.

[2] The Development of Lytoceras and Phylloceras, *Proc. Cal. Acad. Sci.*, third series, Geology, vol. i, No. 4, 1898.

[3] On the Young of Baculites Compressus Say, *Proc. Phil. Acad. Nat. Sci.*, 1891, pp. 159, 160; and The Development of the Shell in the Coiled Stage of Baculites Compressus Say, *Proc. Phil. Acad. Nat. Sci.*, 1892, pp. 136–141.

B. compressus has two revolutions in its coil. But the development of the two species is essentially the same, and the genus is monophyletic, in so far as observations on two species can demonstrate it. Dr. Brown thought that the larval stages of Baculites showed analogy with those of Crioceras and Ancyloceras, and none with Scaphites. In all probability, however, all three of these genera are polyphyletic, and have originated from several stocks. Some species of Scaphites seem to come from a Hoplites-like ancestor, but in studying the development of some undescribed Scaphites from the upper Cretaceous of southern Oregon the writer found their larval stages to be very like those of Lytoceras and Baculites, and they probably have a common origin.

Straight degenerate forms have appeared in the history of the cephalopods from time to time, from the Trias upward, not from any one stock in particular, and not genetically connected. The mere fact that the form is abnormal is no indication whatever of kinship. In each case they spring from normal forms and indicate their origin in their normally coiled young. Naturally it is seldom that transitional forms from the progressive to the degenerate are known, for the beginnings of these transitions are regarded as mere freaks of some normal species. Further, degeneration or retardation is not necessarily accompanied by abnormality of form, as has been shown by the writer in the case of *Lytoceras alamedense* and in the development of Placenticeras,[1] where the genus is still progressive in many characters. Whether normal or abnormal in shape these degenerate forms are always short lived, for they represent the extreme specialization of which the group is capable, while the more primitive stocks or radicles persist through very long periods, often little changed, but from time to time giving rise to the abnormal forms as side branches. These side branches coming off from the parent stock at no great distance in time from each other may give the semblance of a genetic series, but this is usually deceptive. It is thus supposable that some of these forms have originated from the parent stock from

[1] The Development and Phylogeny of Placenticeras, *Proc. Cal. Acad. Sci.*, third series, Geology, vol. i, No. 7, 1900.

different species and at different times, in which case the genus would still be strictly monophyletic. But in the case where the resemblance is merely that of shape and not of development, as in the several species of Scaphites, the genus is not monophyletic, and the forms of which the development is different from that of the type cannot strictly be placed in that genus.

Baculites probably originated from Lytoceras, but it is not at all likely that all species of Baculites came from the same parent Lytoceras, nor, indeed, in the same region, for this degenerate form is too widely distributed and too short lived geologically for this to be probable. This supposition would presuppose for Baculites means of distribution surpassing those of the other invertebrates, which we know could not have been the case, for they were not pelagic forms, but shore dwellers, and individual species are no more widely distributed than the gastropods and pelecypods that are associated with them.

STANFORD UNIVERSITY, CALIFORNIA.

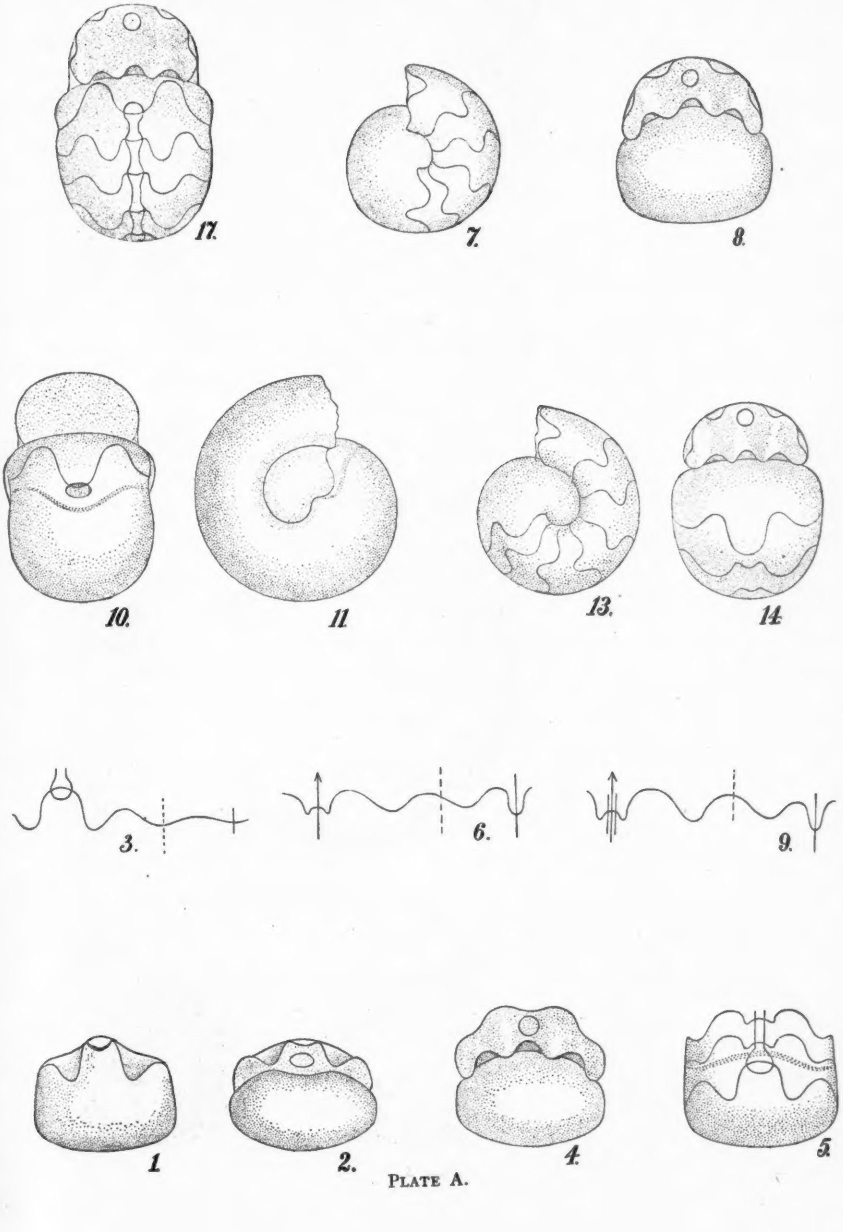


PLATE A.

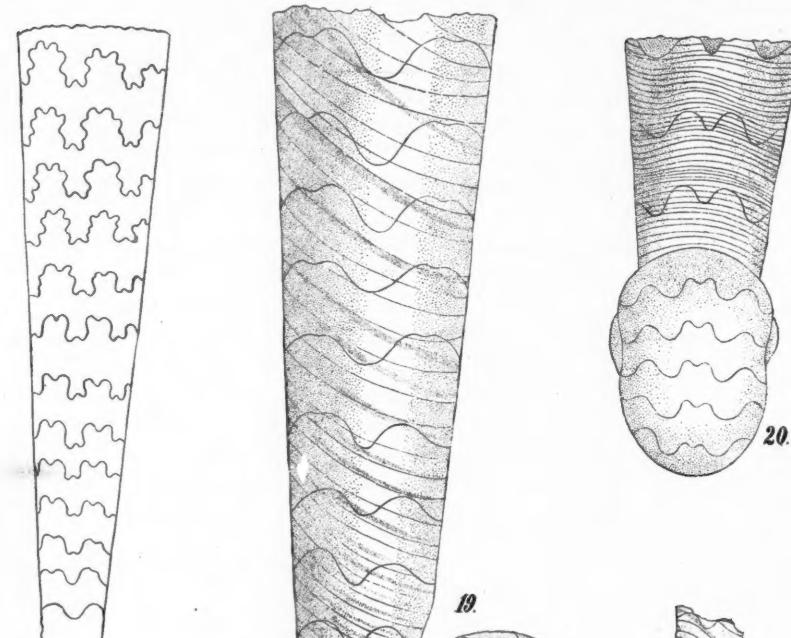


Plate B.

EXPLANATION OF PLATES.

The Development of the Larval Coil of *Baculites chicoensis* Trask.

FIGS. 1 and 2. Protoconch, front and top view, diameter 0.48 mm. Thirty times enlarged.

FIG. 3. First or ananepionic septum, showing the siphonal cæcum.

FIGS. 4 and 5. Larval shell at one-fourth coil, diameter 0.58 mm., showing the ananepionic and metanepionic septa, and the embryonic constriction. Thirty times enlarged.

FIG. 6. Second or metanepionic septum, at one-fourth revolution, diameter 0.58 mm.

FIGS. 7 and 8. Larval shell at one-half coil, diameter 0.68 mm. Thirty times enlarged.

FIG. 9. Sixth septum, at one-half revolution.

FIGS. 10 and 11. Ananepionic shell, showing the embryonic constriction, the ananepionic septum, the siphonal cæcum, and the first larval body chamber. The young animal died before further development took place. Thirty times enlarged.

FIG. 12. Ananepionic shell, showing ornamentation of the embryonic and early larval shell, and the ananepionic body chamber. Thirty times enlarged.

FIGS. 13 and 14. Metanepionic shell at three-quarters of a coil, diameter 0.83 mm., showing contraction of the later chambers.

FIGS. 15 and 16. Shell at end of the metanepionic stage, diameter 1.06 mm., one and one-eighth coils. Thirty times enlarged.

FIG. 17. Metanepionic shell, diameter 1.00 mm., showing periodic swelling of the siphuncle, indicating a retardation of the phylembryonic siphonal cæcum. Thirty times enlarged.

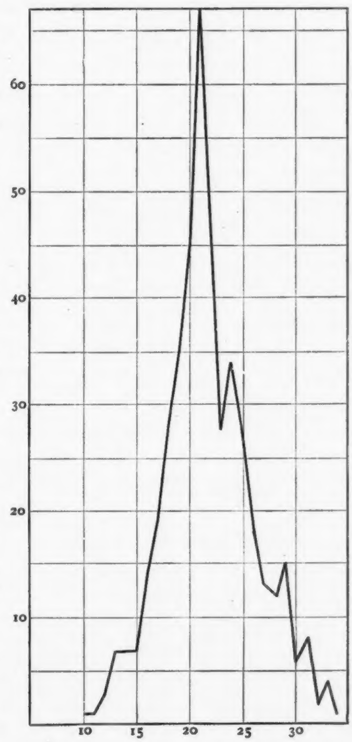
FIG. 18. Larval coil attached to the straight shaft, showing all the stages from phylembryonic through the paranepionic, and the beginning of the adolescent or neanic stage. Ten times enlarged.

FIGS. 19 and 20. Front and side view of a metaneanic shell, showing the unsymmetric shape of the larval coil, and the contraction of the metanepionic body chamber. Thirty times enlarged.

FIG. 21. Composite specimen, drawn from several pieces, showing the development of the septa from the ananepionic into the adolescent stage. Ten times enlarged.

VARIATION NOTES. — Nos. 1–3.

1. *Frequency Curve of White Daisy.* — Mr. F. C. Lucas, of the Englewood High School, Chicago, who published a paper on "Variation in Ray Flowers of the White Daisy," in the *American Naturalist* for 1898, has sent us counts made on 444 white daisies collected along the roadside at Northwood, New Hampshire. The results are given in the accompanying curve, where the number of rays (the class) is indicated by the figures at the bottom, and the number of individuals occurring in (the frequency of) each class is indicated by the vertical scale.



The curve is compound. The principal mode is at 21, where Ludwig found it for European individuals. Secondary maxima occur at 13, at 24 (= 3 × 8), and also at 29 and 31. What the latter maxima mean is uncertain; Mr. Lucas calls attention to the fact that they occurred in his specimens from Massachusetts also. We shall be glad to publish the results of counting lots of 1000 to 2000 terminal flowers (only one from each plant) from each of various localities.

2. *Variation in the Branchial Filaments of Aquatic Lepidoptera Larvæ.*[1] — The larvæ of the Pyralid *Paraponyx obscuralis* from the Illinois River at Havana have just [always?] 100 branched branchial filaments (gills) arising from the dorsum of the middle segments. The number of branches to a gill is modally different for the different gills, and for the corresponding gill in successive moults. In each gill of the full-grown larva, however, the number of branches is subject to individual variation. The following table gives the modal number of branches for each gill of the full-grown larva.

Segments.	*a.s.*[2]	*p.s.*	*a.i.*	*p.i.*	*ped.*
2	6	5	3	5	6
3	6	5	3	5	6
4–7	4	6	4	5	5
8–10	4	6	4	5	4
11	4	6	4	5	
12				3	

3. *Inheritance in Tailless Cats.* — A female Manx cat (with rudimentary tail) had six litters by normal male cats. In these litters the number of abnormal (Maternal type) and of normal (Paternal type) kittens was as follows:

Litter 1	1 *M*
" 2	5 *M* + 1 *P*
" 3	3 *M* + 2 *P*
" 4	1 *M* + 2 *P*
" 5	1 *M* + 3 *P*
" 6	3 *M* + 2 *P*
	14 *M* + 10 *P*

The maternal (Manx or abnormal) quality was prepotent. Also, there was a loss of this prepotency in the later litters. Was this due to telegony? — R. Anthony in *Bull. Soc. d'Anthrop. de Paris*, 4 sér., vol. x, p. 303, 1899.

[1] Hart, C. A. On the Entomology of the Illinois River and Adjacent Waters, *Bull. Illinois State Lab. Nat. Hist.*, vol. iv, 149–273, 1895.

[2] *a.*, anterior; *p.*, posterior; *s.*, suprastigmal; *i.*, infrastigmal; *ped.*, pedal.

EDITORIAL COMMENT.

Pseudoscience. — The leading article of a recent issue of *The Forester*, entitled "On the Possible Effects of the Gypsy Moth on American Forests," is noteworthy as containing a number of far-fetched conjectures that are dangerously near charlatanry. The following quotation will more than substantiate our statement: "It is not unlikely that some of the curious alterations in the distribution of forest trees which geologists have recognized may have been due to the development in former ages of the Gypsy Moth or other like destructive species of insect. Thus in the early Miocene Tertiary Europe was tenanted by a host of arboreal species closely akin to those that now form our admirable American broad-leaved forests. The Magnolias, the Gums and the Tulip trees, etc., were then as well developed in Europe as they are in this country. Suddenly all these species disappeared from the old world. There is no reason to believe that the change was due to an alteration in climate. There are many evidences indeed that such was not the case. It is a very reasonable conjecture that that alteration was brought about by the invasion of an insect enemy which may have been the ancestor of the Gypsy Moth."

Against this "very reasonable conjecture" the words of Dr. Asa Gray may be recalled: "Probably the European Miocene forest was about as rich and various as is ours of the present day, and very like it. The Glacial period came and passed, and these types have not survived there, nor returned."

The statement also "that the naturalist who attained the unhappy success" of introducing the gypsy moth into America did so for the purpose of interbreeding the introduced insects "with various native species of moths, with the expectation of producing a hybrid which would feed on the leaves of our numerous American species of oak and produce a valuable kind of silk," shows an absolute lack of the first essentials of successful hybridization; moreover, it does injustice to a man of pure science whose imagination never rioted with vagaries.

"News" in the American Naturalist. — Owing to the length of time which must necessarily elapse between the preparation of

the manuscript and the appearance of the printed page, the editors have thought it best to drop the department of "News" which has long been a feature in this journal. This step is taken the more willingly since our contemporary, *Science*, covers the same field in so able a manner, and with its weekly issue can present items of news far more promptly than we are able to.

The notices of appointments, retirements, and deaths have been approximately complete ever since the journal passed into its present control. This feature will be retained, not as a matter of news but as a matter of record, and will be presented every three months with the endeavor to have this record as nearly complete as may be.

Another feature which will form part of the record, and which appears for the first time in the present number, is the record of gifts to what may be termed educational institutions, including colleges, technical schools, libraries, and the like. In our present record, which includes eleven months of the year 1900, we note the gifts of over $16,000,000 to these purposes. Scattered through the pages of a weekly or monthly journal these items make but little impression on the reader, but gathered at intervals of six months or a year they are ample evidence of the generosity of our wealthy people and of those who are classed among the "well-to-do." In contrast with this liberality of the moneyed classes of America stands the parsimony of the same classes in the Old World. Gifts of a similar character there are rare. An instance comes before us as we write. During the past year Brown University raised over one million dollars and in this way secured an additional gift of a quarter of a million more. During two years past the University of Cambridge, one of the two great universities of England, has been trying to increase its funds, both for endowment and for new buildings, and in spite of constant efforts it has been able to raise but a little over three hundred thousand dollars (£62,500).

REVIEWS OF RECENT LITERATURE.

ZOÖLOGY.

Hammar's Layer. — Professor Hammar had previously[1] given facts that led him to believe that blastomeres of many animals are connected by a continuous membrane-like expanse of protoplasm that forms the outermost part of each cell and passes over from cell to cell. This cleavage would result in only partial subdivision and not in complete isolation of cells. Moreover, the cleavage cavity would be a hollowed-out interior space, not outside space extending in between the cells.

In a recent paper[2] he advances some new facts and considerations in support of the thesis that this connection of blastomeres is a protoplasmic part of the egg and not a dead "membrane," and, secondly, that it is a primary connection always there, and not a secondary connection established from time to time as are the filose threads previously described by others and now, apparently, seen by Hammar in preserved eggs.

E. A. A.

What holds Blastomeres together? — Curt Herbst[3] adds to his previous work upon the chemical environment of echinoderm eggs and larvæ a series of observations upon eggs in an artificial sea-water free from calcium.

Eggs in various stages of cleavage thrown into such a solution may continue to cleave and even to differentiate so that some cells may show cilia; but the blastomeres do not cohere, but fall apart and develop separately. This, however, takes place only when the eggs have been shaken to remove the membrane, that else holds the cells together to some extent.

When the isolated cells are put back into water with lime they cleave and cohere, so that many little larvæ result from one egg.

The cause of the falling apart of the blastomeres is not clear. Herbst supposes they are normally held together by the tension of

[1] See Review, *American Naturalist*, 1896, p. 597; and 1897, p. 454.

[2] *Arch. f. mikr. Anat.*, Bd. lv. February, 1900.

[3] *Arch. f. Entm.*, Bd. ix, Feb. 20, 1900.

Hammar's layer, the ectoplasmic layer that passes from cell to cell, and that the absence of lime so modifies this membrane as to prevent it from holding the cells together. The actual moving apart of the cells he thinks due to their individual movements. Yet the author grants that some other factor remains for future research to discover, since when cells that have fallen apart in water free from lime come together again and flatten against one another in normal water, there is no normal membrane present.

That one such factor is a pathological state of the ectosarc accompanied by abnormal "filose activities" seems indicated by the author's figures. E. A. A.

Vitality of Eggs and Sperms. — James F. Gemmill[1] records some interesting observations upon the life of sperm and egg. Sperms of the sea-urchin, *Echinus sphæra*, put into still water, move only seven inches before dying, so that their power of dissemination must depend largely upon currents of water and not upon their own locomotion.

In a tube of 2.4 mm. diameter they ascended 12.6 mm. in 7 minutes; 31.6 mm. in 20 minutes; and 44 mm. in 45 minutes. In tubes of different sizes these sperms ascended a shorter distance in the narrower tubes.

Sperms of an annelid were found to live longer if the water contained *bouillon;* hence the author infers they are able to nourish themselves.

To keep the sperm alive long the amount of sea-water added must not exceed nine times the bulk of sperm. When the sperm and water formed an opaque white liquid the sperms lived seventy-two hours; but when the sperm was diluted with water till only slightly turbid the sperms died in three to five hours.

That the sea-water stimulates the sperm is inferred from the observation that even immature sperms became active when put into water.

The eggs of this sea-urchin are in best condition for fertilization during the first four hours after being discharged into the water, but there is little loss of vitality up to nine hours. In seventeen hours many develop abnormally, and many not at all. In twenty to twenty-four hours only one to two per cent develop, and no development was observed after twenty-eight hours. On the other hand, when the eggs were fertilized immediately after discharge into the water, polyspermy and irregular development were apt to take place.

[1] *Journ. Anat. Phys.*, vol. xxxiv, January, 1900.

When an adult was kept thirteen hours in the air there were no normal developments from the eggs as first shed, but when these eggs were kept four hours in water seventy-five per cent developed. The author interprets this as meaning that the eggs were in a "state of semi-asphyxia" and gradually recovered in the water.

The action of sperm upon moribund eggs is remarkable in that it hastens their disintegration, causing them to form blister-like elevations, to become vesiculated, and to exhibit a sort of pseudo-cleavage. When dead the eggs are not changed by sperm and keep their form for days.

E. A. A.

Animal Life.[1] — This text-book of zoölogy is outside the usual line, as might be expected in one of Appleton's "twentieth-century text-books," written by the president of Leland Stanford University. Like the *Study of Animal Life* of Arthur Thomson, it is not a laboratory manual but a book to be read for stimulus and instruction, not for training in observation and deduction.

It is a book on animal "ecology," emphasizing life as *adaptation*. In it structure and function go hand in hand, function leading the way.

The authors briefly consider the activities of the Protozoa, and the lowest Metazoa, then take up chapters upon the sex and reproduction of animals, function and structure, the life cycle, the primary conditions of animal life, the crowd of animals and the struggle for existence, adaptations, animal communities and social life, commensalism and symbiosis, parasitism and degeneration, protective resemblances and mimicry, the special senses, instinct and reason, homes and domestic habits, and the geographical distribution of animals.

Its simple elementary treatment, excellent illustrations, and the piquancy of new facts gathered from the Pacific shores make it a most attractive volume which should play a good part in awaking interest in zoölogy. Yet used as "a first book" and, it may be, as an only book, there is danger of catering to the desire to know what we now think of animals rather than to know animals themselves.

E. A. A.

The World of the Great Forest.[2] — This latest product of Du Chaillu's busy pen is an endeavor to present to young people a

[1] Jordan, D. S., and Kellogg, V. L. *Animal Life.* A First Book of Zoölogy. New York, Appleton, 1900. 311 pp., 180 figs.

[2] Du Chaillu, Paul. *The World of the Great Forest.* With over fifty illustrations by C. R. Knight and J. M. Gleeson. New York, Charles Scribner's Sons, 1900. 322 pp.

picture of animal life in the forests of equatorial Africa. The book is divided into short chapters, each devoted to a pair, or a community of animals, from the huge pachyderms to the smallest insects. The animals are made to discourse very naïvely to each other on the hardships and joys of their life, and to describe the special adaptations that fit them for it. There is no attempt at a connected story, or at any incidents which would not naturally result from the simple motives which influence the actions of animals, their care for their young, and their desire for food. The book is the story of the vicissitudes of wild life, the periods of plenty alternating with those of want, — a life where only activity or ingenuity or patience can hope to maintain itself. This is a refreshingly wholesome point of view in this age, when our views of animals are too much tinged by imaginative sentiment. The constant repetition of much the same story, however, makes the three hundred and odd pages rather difficult reading, especially as they are never lightened by a ray of humor. Native names for the animals are early introduced and then used exclusively, so that the memory must bear a constantly increasing burden. When the "nkengos" say that they are glad that they have found no traces of "nginas, nshiegos, mbouvés, and koolookambas," we gain, despite the glossary, but a confused idea of the cause of their joy. The book will hardly arouse an interest in animals in children who do not already possess it, but on the other hand it will teach them nothing that is not true, unless it be an exaggerated idea of the range of an animal's thought. The book cannot fail to win a valuable place in a school or juvenile library, and will teach those who have an interest in animals many details of the life history of African animals in particular, and a very just conception of wild life as a whole. The illustrations are all good and some are excellent.

R. H.

Mooswa and Others of the Boundaries.[1] — The author of *Mooswa and Others of the Boundaries* says in his introduction: "Perhaps this story is too simple, too light, too prolific of natural history, too something or other — I don't know; I have but tried to tell the things that appeared very fascinating to me under the giant spruce and the white-barked poplars, with the dark-faced Indians and the open-handed white trappers sitting about a spirit-soothing camp-fire." The suspicion here intimated that he has perhaps not succeeded in

[1] Fraser, W. A. *Mooswa and Others of the Boundaries.* Illustrated by Arthur Heming. New York, Charles Scribner's Sons, 1900. 260 pp.

imparting the fascination to his readers seems to us justified. The story is certainly "light," but whether it is "too prolific of natural history" may be questioned.

The scene of the story is laid in the forests of the Athabasca, in which a lad of fourteen spends the winter in the charge of a half-breed trapper. The interest of the story lies in the successful efforts of the animals of the region to save their skins from the trapper, and later in the endeavors of Mooswa, a moose whom the boy once befriended, to save the boy from starvation.

If the book is an attempt to convey, in the form of a story, knowledge of the ways of animals, it is a failure, for whatever truth it may contain is obscured by a bewildering amount of romance. Thus when the fox is caught in a trap, the beaver gnaws off his foot, and the Canada Jay sews the skin over the stump with his beak. If the author has tried to make a good tale, after the pattern of the Jungle Books, he has failed through lack of the requisite literary skill. The story is presumably intended for boys, but even boys, if fed on Kipling and Seton-Thompson, would tire of the idle chatter which is put into the mouths of the principal interlocutors. The book is by no means bad; there are humorous situations, and even moments of interest, approaching excitement. A decade ago it might have proved acceptable, but the standard of excellence in such matters has been set too high, by the creators of Mowgli and Wab, for any but skillful artists to hope for success in the field. The illustrations are far superior to the text.

R. H.

Miller's Key to the Land Mammals of Eastern North America.[1]— Probably no recent contribution to the literature of North American mammalogy will be so gratefully and widely welcomed as Mr. Miller's brief synopsis of the land mammals of eastern North America. So great has been the increase in our knowledge of the subject during the last fifteen years, so radical the changes in nomenclature, so different the present methods of investigation, and so scattered the literature that has been the outcome of this renaissance, that only the few specialists engaged in the work could hope to keep in touch with the subject. The general student hence found himself hopelessly lost in intricate labyrinths in any attempt he might make to gain a clear conception of the results thus far reached, in even a limited

[1] Miller, Gerrit S. Key to the Land Mammals of Eastern North America, *Bulletin of the New York State Museum*, vol. viii (October, 1900), No. 38, pp. 59-160.

field. Mr. Miller's Key gives at once a bird's-eye view of the scene, and directs the inquirer where further information may be obtained.

The geographical scope of the work includes "the entire mammalian fauna of the Atlantic slope of North America north of the southern boundary of the upper austral zone," or the Atlantic slope from Hudson Bay to the southern boundary of what is commonly known as the "Carolinian Fauna." The Mississippi drainage area is thus wholly excluded. A brief introduction defines the life zones of the region and the plan of the Key, followed by a synopsis, giving a classified list of the higher groups, species and subspecies. Then comes the Key proper, supplying diagnoses of all the groups from class to subspecies, subfamilies and subgenera excepted. Under each species and subspecies are given "references to (1) the first publication of the specific or subspecific name, (2) first use of the binomial or trinomial combination, and (3) a recent monographic paper in which the form is described in detail. . . . The type locality is given in parenthesis after the first reference. The accented syllable of all technical names is marked by an accent; and the derivation of each name is placed in parenthesis at the end of the diagnosis." A paragraph, in larger type, follows the diagnosis, giving the distribution of the species or subspecies under consideration. The Key is thus intended to give the correct nomenclature for all the forms treated, with a clue to their identification, and a brief statement of their geographical ranges, generally indicated by a reference to the "life zone" they inhabit. This admirable brochure is thus what it claims to be, a "key" to the subject, and an aid to the acquisition of further information. That the work was greatly needed, has been well done, and will prove a "boon" to seekers of knowledge in this field, it is needless to further affirm.

The Key was originally planned to form part of Mr. Miller's recently published "Preliminary List of the Mammals of New York" (see *American Naturalist*, April, 1900, pp. 316–318), but "soon grew to the proportions of an independent paper," and was finally extended to include a larger area. The Key, we regret to see, repeats the few errors of nomenclature of the list, to one of which attention has already been called in this journal (*loc. cit.*, p. 318), namely, the highly questionable basis of the specific name "americanus" for the Virginia deer. Another case is the use of the specific name "hudsonica Desmarest" (1803) for the otter. As we have already shown (*Bull. Amer. Mus. Nat. Hist.*, Vol. X, 1898,

pp. 459, 460), canadensis Schreber (1778) is perfectly tenable for this species, for those who accept names based on plates, as does Mr. Miller in the case of the mink, *Putorius vison* (Schreber), which rests on the same basis as *Lutra canadensis* (Schreber) for the otter. Moreover, the name "canadensis" had been in almost universal use for this species till two years ago, when an unfortunate attempt was made to replace it by "hudsonica," of twenty-five years later origin.

Another case that may be mentioned is the use of the generic name "Rosmarus" for the walruses instead of the prior name "Odobenus." Rosmarus Scopoli dates from 1777; Odobenus Brisson from 1756, becoming perfectly tenable from Brisson's second edition of his *Règne Animal*, published in 1762, or fifteen years before the tenable date of Rosmarus. We can hardly believe Mr. Miller has given these points due consideration.

There are no really new innovations in the technical nomenclature, but a new subspecies of the common deer is described on p. 83, under the name *Odocoileus americanus borealis*. The number of species treated is 105, with thirty-three additional subspecies.

J. A. A.

Pectoral Girdle of Reptiles. — Professor Max Fürbringer's[1] long interrupted studies on the comparative anatomy of the pectoral girdles and their muscles and nerves in vertebrates have been continued in a fourth part devoted to these organs in the Amphisbænia and the reptiles. The first 150 pages are devoted to an extended account of the skeletal elements of the pectoral girdles, breastbone, and humerus, including these parts in the fossil as well as in the recent representatives of the groups under consideration. This is followed by an account of the nerves to the shoulder muscles, after which a very exhaustive description of the shoulder muscles themselves is given. A final discussion of over 150 pages deals in a comparative way with the facts brought forward in the descriptive part and concludes with remarks on the phylogenetic relationships of the groups of reptiles to one another, to the birds, and to the lower vertebrates as shown by the structure of the parts described. The illustrations, some seventy figures in all, are beautifully clear and exact, and with the text constitute a work of monumental proportions.

P.

[1] Fürbringer, M. Zur vergleichenden Anatomie des Brustschulterapparates und der Schulterumskiln, *Jena. Zeitschrift für Naturwissenschaft*, Bd. xxxiv (September, 1900), pp. 215–718, Taf. XIII–XVII.

The Neurone in Anatomy and Physiology. — The neurone theory of the structure of the nervous system as promulgated by Waldeyer in 1891 has been subjected to nearly ten years of rigorous criticism, and the outcome of this, so far as the present standing of the theory is concerned, has been well presented by Professor Verworn,[1] in his address before the Seventy-Second Meeting of the German Naturalists and Physicians. The fundamental postulate of the neurone theory, namely, that nerve fibres are processes from ganglion cells and that the so-called ganglion cell with these processes constitutes the real cellular unit of the nervous system, is clearly stated at the outset. The possibly closer union of these units than has heretofore been admitted, particularly by the adherents of the contact theory, is considered in the light of the recent work by Apáthy and by Bethe and pronounced still uncertain. The whole issue of this discussion is rightly shown to be of secondary importance so far as the stability of the neurone theory is concerned.

From the physiological side the author makes an excellent presentation of the question as to the significance of ganglion cells. The recent arguments of Bethe and of Steinach, to the effect that central nervous operations are possible without ganglion cells, are shown to be inconclusive, and many important observations made on animals subjected to nerve poisons are adduced to show that central nervous operations are dependent on ganglion cells for more than a supply of nutritive material. The essay concludes with the statement that the anatomical and physiological investigations of the last ten years have left the neurone theory on a firm basis and is unquestionably one of the best recent estimates of the present standing of that theory.

P.

Avian Helminths. — An important contribution on the frequence and distribution of the internal parasites of birds has recently been published by Wolffhügel.[2] In all 630 hosts belonging to 73 species of birds were examined. Most of them were native in the country immediately bordering on the southern Rhine, but a few came from the collection of the Basel Zoölogical Garden. In all 180 birds proved to be uninfected; the rest harbored of cestodes 35 species in 231 hosts, of trematodes 19 species in 124 hosts, of nematodes 26 species in 252 hosts, and of Acanthocephala 11 species in 41 hosts.

[1] Verworn, M. *Das Neuron in Anatomie und Physiologie.* Jena, G. Fischer, 1900. 54 pp.

[2] Wolffhügel, K. *Beitrag zur Kenntnis der Vogelhelminthen.* Dissertation. Freiburg, B. 1900. 204 pp., 7 double plates.

Different kinds of birds varied very greatly in number and type of parasites sheltered, and forms common in the one would be entirely absent or rare in the other. Full results of the examinations are given in a series of tables which show the number, condition, location, and name of the parasites collected and the date, locality, collector, and name of the host. The second half of the paper is devoted to an anatomical description and discussion of some of the less known cestodes found. The descriptions are full and contain many new points which are well illustrated on the plates. One new species, *Hymenolepis tetraonis*, was discovered in the quail, in which it is apparently very common. H. B. W.

Revision of the Ticks. — Of this work by Neumann,[1] a third part has just appeared. It covers the tribe of the Ixodæ, including the eyeless genera Ixodes, Hæmalastor, and Aponomma, and the genera Hyalomma and Amblyomma which possess eyes. Analytical keys for each genus, based on the characters of the male, of the female, and of the nymph, and full bibliographic references make the work a mine of information. Inasmuch as the ticks from the collection of the Bureau of Animal Industry were placed in the hands of the author for this revision, it has a peculiar value for American students; this usefulness is greatly enhanced by the full references given under geographical distribution to the individual states of the Union from which the specimens have been collected. With delicate courtesy the names of new species taken from labels written by the late George Marx are used and the species credited to that author ; many of his drawings are also incorporated in the article, although for the text Professor Neumann is alone responsible. The most important change in the nomenclature of American forms is the suppression of *Ixodes unipunctata* Packard, the Lone Star Tick, as synonymous with *Amblyomma americanum* Koch. The illustrations of the revision are good, the text clear and concise, and the work is evidently carefully done, making it altogether the most important contribution in this group since the monograph of Koch. A fourth part to include additions, corrections, and general considerations of a taxonomic character to conclude the work will appear soon. H. B. W.

The Coccidæ of Brazil. — As recently as 1897 Dr. H. von Ihering catalogued the Coccidæ of Brazil, but he was able to enumerate

[1] Revision de la famille des ixodidés, *Mém. Soc. Zool. France*, tome xii (Paris, 1899), pp. 107–294, 63 figs.

only twenty-one species. Mr. Adolph Hempel has since that time been actively engaged in their study, and as a result he has published a work entitled "As Coccidas Brazileiras," in which he describes no less than 131 species as occurring in Brazil. This work, which was received by the present writer on Sept. 26, 1900, appears in Vol. IV of the *Revista do Museu Paulista*, and is, unfortunately, in Portuguese. By reason of its place of publication and the language in which it is written, it may escape the attention of some coccidologists, but it is in reality one of the most important contributions to the study ever produced.

The new genera described are Cryptokermes, Stigmacoccus, Apiococcus, Tectococcus, Tectopulvinaria, Pseudischnaspis, and Diaspidistis. Stigmacoccus, though placed in the Coccinæ, is doubtless a Monophlebine, and singularly enough, it appears to be identical with Perissopneumon, Newstead, described from India in *Entomologists' Monthly Magazine*, November, 1900. The simultaneous discovery on opposite sides of the world of this striking and distinct type is remarkable. Pseudischnaspis is an offshoot from Chrysomphalus, and will include, besides the Brazilian species, *P. longissimus* (Ckll.) and *P. bowreyi* (Ckll.), hitherto referred to Chrysomphalus.

T. D. A. COCKERELL.

Notes. — The development of the common tubularian, *Parypha crocea*, has been worked over by C. M. Allen (*Biol. Bull.*, Vol. I, p. 291). Each sporosac is an outgrowth of the body wall of the polyp, and since it shows evidence of four radial canals, it must be regarded as a much reduced medusoid. The genital cells, both male and female, are derived from the ectoderm of the medusoid. The egg grows by absorbing adjacent cells. Its nucleus is said to be absorbed at an early stage and is later re-formed from the scattered fragments. Segmentation is very irregular and is often outrun by the nuclear divisions. The ectoderm and entoderm are differentiated by delamination. The embryo escapes as an actinula with both basal and buccal tentacles.

The segmentation of that portion of the neural tube which forms the brain in teleosts has been studied by Charles Hill (*Zool. Jahrb.*, Bd. XIII). The region destined for the forebrain is represented by three segments, that for the midbrain by two. These segments early disappear and are replaced by secondary expansions which have been mistaken for segments. The segments of these two portions of the brain are serially homologous with those of the posterior

part which are six in number and persist to a much later stage in ontogeny. Of these the first gives rise to the cerebellum, and the remaining five to the medulla. The brain thus consists of eleven neural segments.

As a suggestion of what might be done, the work of T. B. Pieri (*Arch. Zool.*, Exp. III, p. xxix) is interesting. Having shaken the sperm of sea-urchins in a bottle of water for one-quarter of an hour, he found the sperms apparently dead. When passed through a filter the liquid, water and sperm, was added to sea-urchin eggs and these developed into many-celled stages. The author would fain see here the action of a soluble ferment which he would call ovulase; this truly would be "féconde en consequences biologiques et philosophiques." However, he sees clearly that the experiments fail in that the filtration did not remove the sperms and that some of the sperms may not have been killed.

The free-swimming copepods of the Woods Holl region have been described in the *United States Fish Commission Bulletin* for 1899 by Professor W. M. Wheeler. The paper contains accounts of thirty species, several of which are new, as well as excellent tables for the identification of these crustaceans.

The peripheral distribution of the cranial and first two spinal nerves of the salamander, *Spelerpes bilineatus*, has been worked out by Miss M. A. Bowers. The paper, which is published in Vol. XXXVI of the *Proceedings of the American Academy of Arts and Sciences*, is illustrated by four figures in which the nerve components are brought out by appropriate colors.

Special Bulletin No. 4 from the United States National Museum consists of a monograph of the American hydroids belonging to the family Plumularidæ by Professor C. C. Nutting. The memoir includes a general account of the group and descriptions of some 120 species, nearly half of which are new to science. It is illustrated by thirty-four plates, containing over 300 figures.

The peculiar trematode, *Macraspis elegans* Olsson, has been studied recently by Jägerskiöld (*Kgl. Vet.-Akad.*, pp. 197–214, Stockholm, 1899). Good illustrations give the form, which varies greatly as between old and young individuals. The entire structure, especially that of the reproductive system, shows such similarity with that of the digenetic trematodes that the author is not inclined to separate the Aspidobothridæ so widely from them as has been the custom hitherto.

A new genus of ectoparasitic trematode, *Aporocotyle simplex*, has been discovered by Odhner (*Centralb. Bakt. u. Par.*, 1. Abt., Bd. XXVII, p. 62) on the gills of Pleuronectes. It stands in sharp contrast with all forms of the group hitherto described, in that it lacks entirely the suckers and all other specialized apparatus for attachment so characteristic of the group.

The endoparasitic trematodes of Chelonia are treated by Braun in two articles (*Centralb. Bakt. u. Par.*, 1. Abt., Bd. XXV, p. 714, and Bd. XXVI, p. 627). A considerable number of species, both old and new, are carefully described. Among the latter is an American form, *Monostoma renicapitate*, which has not been noted since the original scanty description of Leidy.

The species of Filaria found in human blood are discussed by Von Linstow (*Zool. Anz.*, Bd. XXIII, p. 76). The characteristics of each supposed species are given in full, with citations from some rather inaccessible authorities. The distribution of each is also considered.

Mr. Willis S. Blatchley's *Twenty-fourth Report of the Geological Survey of Indiana* contains, besides important geological and mining matter, a number of valuable papers on the local natural history. E. B. Williamson contributes a descriptive catalogue of the Dragonflies; R. E. Call, an illustrated catalogue of the Mollusca, and Stanley Coulter a catalogue of flowering plants and ferns. Mr. Blatchley continues his useful notes on the reptiles and batrachians of Vigo County.

BOTANY.

Two Recent Mushroom Books. — The last half decade has been notable for the number of new mushroom books and papers, and even more for the increase in fungus-eating in this country. Up to the time that the late Mr. Gibson turned his happy faculty of pen and pencil to the subject, most people had held a vague but fixed idea that none but the expert mycologist could turn mycophagist at large without the probability being great that his friends would ultimately record in sadness the final result of some last experimental eating of a species "supposed to be" wholesome, — only Morels, "the" Mushroom, and a few others grossly marked being safe for the layman's consumption. By his clear descriptions and exquisite

illustrations Mr. Gibson made possible the recognition of a few — but sufficient — common edible species, while the fact that nearly all of the fatal cases of toadstool poisoning are caused by *Amanita muscaria*, and *A. phalloides* and its closest relatives, led him to brand the genus Amanita so forcibly that few of us now care to eat any volva-bearing agaric, however wholesome and delicious experience may have shown it to be. The only really weak point in his *Our Edible Toadstools and Mushrooms* lies in the very emphasis of this most wholesome warning against all amanitas, which causes the minor caution against lurid Boletuses, the emetic Russulas, and other "suspected" species to be overlooked, — a caution reiterated emphatically in Professor Farlow's review of the book in the columns of *Garden and Forest*.

Mycological clubs and amateur mycophagists have wonderfully multiplied and thriven under the stimulus of this book, which, with its selection of a few unmistakable edible agarics and its branding as deadly of the Amanitas, provides a sufficiency of fungus food for ordinary culinary purposes, with a good mapping out of the safest lines of exploration for the venturesome who must go farther. So far as I know, no fatal or extremely serious cases of toadstool poisoning traced to species not of Amanita have occurred in this country in the last few years, except that a well-known phycologist, turned mycophagist, slipped in his determination of a Boletus which he thought he recognized from one of Mr. Palmer's plates, and, with his family, paid a severe, if not the extreme penalty for the error; and that one fatal mistake and several less serious ones have been made in considering *Agaricus* (*Lepiota*) *morgani*, an agaric rather common especially in the West, as fit for food, as its congeners appear to be.

The latest important contributions to mushroom literature are by Professor Atkinson [1] of Cornell University, a teacher of cryptogamic botany, and Captain McIlvaine,[2] who for the past twenty years has been well to the front among the fungus-eaters in this country. Both of these writers are evidently aiming at the same purpose,

[1] Atkinson, G. F. *Studies of American Fungi.* Mushrooms, Edible, Poisonous, etc. Ithaca, N. Y., Andrus & Church, 1900. vi + 275 pp., with 200 photographs by the author and colored plates by F. R. Rathbun.

[2] McIlvaine, C., and Macadam, R. K. *Toadstools, Mushrooms, Fungi, Edible and Poisonous.* One Thousand American Fungi: How to Select and Cook the Edible; How to Distinguish and Avoid the Poisonous. Indianapolis, The Bowen-Merrill Company, 1900. xxxvii + 704 pp., Pl. LXVII, and many illustrations in the text.

Professor Atkinson stating that he has tried to present the important characters which it is necessary to observe, in an interesting and intelligible way, and to illustrate these by life-size photographic reproductions of the larger fungi, the selection of species being made with a view to the representation of the more important genera, chiefly those containing edible species; while Captain McIlvaine, regretting the absence of any book giving the genus, names, and descriptions of the prominent American toadstools, the edibility of which has been tested or the poisonous qualities of which have been discovered, has attempted to give such information for every species known to be esculent in North America.

Both books are illustrated by colored plates and process reproductions from photographs, which, particularly in Captain McIlvaine's book, are supplemented by diagrammatic drawings. The illustration of pileate fungi is a subject about which opinions may and apparently do differ widely. Few colored plates, not even excluding those of the olden time, which were hand-tinted on a lithograph or engraving, represent the colors any too naturally, and it must be said that the illustrations in color in these two books, though often pleasing to the eye, do not materially affect the truthfulness of this statement. On the other hand, uncolored drawings fail to represent characters which, though imperfectly shown in an ordinary colored plate, may be sufficiently closely suggested in it to serve their purpose. The two books in hand contain a wealth of photographic illustration which in excellence is scarcely surpassed by Mr. Lloyd's well-known photogravure sheets of certain American fungi, and which may be taken as representing nearly or quite the best that can be done by process work; and yet, exquisite as some of this work is, and faithful as the photographic portrait must of necessity be, it is doubtful whether the technical characters which, no less than the gross characters, need to be brought out in illustrating the pileate fungi, are as well shown in the greater number of cases as they could be by an artist's skill, guided by the unimpeachable accuracy of the camera and controlled by the fresh dissection.

Both books are primarily intended for the fungus-eater, and yet their scope is very different, and in both cases extends further than that of Mr. Gibson's book already referred to. Professor Atkinson, while covering the genera pretty fully, devotes a great deal of space to comparatively few, but representative, species, poisonous or edible, while Captain McIlvaine, with nearly or quite equal fullness of treatment, attempts to account for everything. It is easier to

prepare a monographic treatment of an entire group, provided one have the material and the literature at hand, than to make and describe a selection of interesting things from that group, since in the former case, barring errors of omission, provided the work be well done, whatever is sought is sure to be found, while in the other case inevitable disappointment awaits the person hoping to learn about something which the author did not consider it desirable or expedient to include. Doubtless Professor Atkinson's book will so disappoint many people, and yet, for even the laboratory student of pileate fungi, it will prove of great value. On the other hand, Captain McIlvaine's book, lacking the critical touch of the expert mycologist, though it contain the names of plants sought, will probably lead to a certain amount of error; yet it too is a book which should be found on the departmental shelves of every American institution in which mycology is taught. For the novice in fungus-eating, both, though helpful, are likely to prove confusing, since the distinctions made between species in the larger book may not prove easy to make with the fresh plants, in many cases, while the number treated in the smaller book, though restricted, is sufficiently great to embarrass ordinary people by tempting them into difficult paths; and no book of a scope greater than that of Mr. Gibson's, in which only thirty edible species are included, is likely to supplant it for the amateur American mycophagist. The present books, like Gibson's, contain numerous recipes for preparing and cooking edible species, and, for the most part, these promise easily made and palatable luxuries where fungi can be obtained in the fresh state.

Perhaps, in view of the uncertainties attending the use of fungi as food, it may be as well to state that in addition to the avoidance of amanitas, even including the wholesome ones for the sake of greater safety, all species unpleasant to the taste or acrid, all Boletuses, and all specimens which show the slightest trace of discoloration or which have been allowed to become in the least stale, should be left to the person who proposes to derive sufficient pleasure from dangerous experimentation to justify in his own mind the tampering with unnecessary and sometimes great risks. Professor Atkinson, in speaking of the unwholesome species, quotes from chemists in a way to show that in addition to muscarine, the deadly alkaloid of *Amanita muscaria*, and phallin, the more deadly toxalbumin of *Amanita phalloides* and *A. verna*, choline, an alkaloid which in decomposition gives rise to muscarine or a related alkaloid more deadly than itself, and helvellic acid, likewise a most energetic

poison, have been isolated from a considerable number of species regarded ordinarily as dangerous only in a minor way or merely suspicious; and there seems little reason to doubt that much of the ambiguity attending fungi of this class comes from the conversion, in their incipient decay, of a minor and perhaps scanty poisonous substance into a much more dangerous one, so that personal idiosyncrasy or differences between individuals in strength of heart action seem capable of accounting for the divergence of opinion as to the edibility of a number of the dangerous species, like Boletuses, *Gyromitra esculenta*, certain Russulas, *Lepiota morgani*, and, indeed, the *Amanita muscaria* itself. T.

North-American Pteridophytes. — A sixth edition of Professor Underwood's handbook of the ferns and fern allies occurring north of Mexico,[1] which appears to have been carefully revised, has recently appeared and is likely to meet with ready sale. In it are incorporated records of the occurrence in one flora of several species not before recorded for it, and descriptions of several species regarded as new to science. The author's recent comprehensive investigations of the priority status of generic names in the ferns have been consistently followed up in this book by the rehabilitation of the well-known species of Cystopteris in the genus Filix, and of what has been known as *Blechnum* (or *Lomaria*) *Spicant* in the genus Struthiopteris, while Aspidium is now replaced by Dryopteris, Polystichum, Phanerophlebia, and Tectaria. T.

Notes. — An interesting note by Professor Kellerman, on an Ohio station for *Cissus ampelopsis* or *Ampelopsis cordata*, with illustrations, appears in the first number of a new journal, *The O. S. U. Naturalist*, published by the biological club of the Ohio State University, which also contains a list of additions to the Ohio flora, notes on collecting and preserving microscopical plants, and a paper by Kellerman on a foliicolous form of *Ustilago reiliana*, which species is believed to possess the characters of Cintractia rather than of Ustilago proper.

Viola alabamensis, a new purple-flowered acaulescent species, is described by Pollard in a recent issue of *Proceedings of the Biological Society of Washington*.

A revision of the Cactaceæ of Paraguay, by Schumann, is being published in current numbers of the *Monatsschrift für Kakteenkunde*.

[1] Underwood, L. M. *Our Native Ferns and their Allies, with Synoptical Descriptions of the American Pteridophytes North of Mexico.* New York, Henry Holt & Co., 1900. x + 158 pp., 35 ff., and frontispiece plate. Price, $1.00.

G. P. Burns publishes an illustrated anatomical study of the Stylidiaceæ in *Flora* for October.

The purple cone-flowers, *Echinacea purpurea* and *E. angustifolia*, have been hybridized for cultural purposes, as appears from a note, with illustrations, by Köhler, in *Die Gartenwelt* for October 20.

Curtis's Botanical Magazine for November contains illustrations of *Erigeron leiomerus* and *Cypripedium guttatum*, of the North-American flora.

A revision of the species of Platanus by Usteri appears in No. 20 of the *Mémoires de l'Herbier Boissier.*

A short popular article on *Monstera deliciosa*, with photographic illustrations, by Theodosia B. Shepherd, is contained in *The Land of Sunshine* for September–October.

A review of the Rocky Mountain Melanthaceæ by Rydberg appears in the *Bulletin of the Torrey Botanical Club* for October. Several species, and one genus, Stenanthella, split off from Stenanthium, are described as new.

K. M. Wiegand presents a revision of the tenuis group of Juncus, in the *Bulletin of the Torrey Botanical Club* for October. Thirteen species are recognized.

A well-illustrated "Short Account of the Big Trees of California" constitutes *Bulletin No. 28* of the Division of Forestry of the United States Department of Agriculture.

Keys to species of Abies and Picea based on leaf anatomy are given in a paper by H. B. Dorner, reprinted from the *Proceedings of the Indiana Academy of Science* for 1899.

The distribution of Chilian Coniferæ forms the subject of a paper by Karl Reiche in the current volume of the *Verhandlungen des deutschen wissenschaftlichen Vereins* of Santiago. Six genera, Podocarpus, Dacrydium, Saxegothea, Araucaria, Fitzroya, and Libocedrus, are considered.

The variations in *Lycopodium clavatum*, and their bearing on phylogeny, are discussed in a paper illustrated with three plates, by R. A. Robertson, in Part IV of the current volume of *Transactions and Proceedings of the Botanical Society of Edinburgh.*

The second fascicle of de Wildeman and Durand's "Contributions à la flore du Congo," published as a part of the *Annales du Musée du Congo*, of Brussels, has recently been completed by the issuance of a

second part, and contains descriptions of a considerable number of new species.

Professor Ascherson contributes a synopsis of the higher vegetation of Helgoland to Vol. IV, N.F., of the *Wissenschaftliche Meeresuntersuchungen* of the Commission for the Scientific Investigation of the German Sea.

Part I of the third volume of Boerlage's *Handleiding tot de kennis der flora van nederlandsch Indie*, comprising the orders Nyctaginaceæ to Casuarinaceæ, has recently appeared.

A series of contributions to the knowledge of the trees of Java, by Koorders and Valeton, is appearing in current numbers of the *Mededeelingen uit 's Lands Plantentuin*, of Buitenzorg.

A paper on "Some Plants of West Virginia," by E. L. Morris, is published in the *Proceedings of the Biological Society of Washington*, under date of October 31.

A number of papers on the plant geography of North America, presented at the New York meeting of the American Association for the Advancement of Science, are published in abstract in recent numbers of *Science*.

A delightfully simple elementary statement of "How Plants Live Together," by Bailey, constitutes *Teacher's Leaflet*, No. 19, of the Cornell University Experiment Station.

An ecological comparison of the arctic and antarctic floras, by Delpino, is reprinted from the publications of the *R. accademia delle scienze dell istituto di Bologna* for 1900.

The structural and superficial modifications induced in a number of succulents, when grown with a liberal supply of moisture, are considered by Brenner in an illustrated paper in *Flora* for October.

Die Gartenwelt for October 27 contains an interesting statement by M. Correvon of the successful manner in which he cultivates Alpine plants in the crevices of a wall in the suburbs of Geneva, and is illustrated by several half-tones, — among them a superb portrait of *Saxifraga longifolia*.

Bulletin 46 of the Agricultural Experiment Station of the University of Nevada, which is No. 2 of the nature-study bulletins of that institution, deals with the flowers and fruits of common trees and shrubs. *Bulletin 47* of the same series considers clover seeds and their impurities. Both are well illustrated.

The harvesting and preparation of balsam of Peru from *Myroxylon Pereiræ* are described by Preuss in *Der Tropenpflanzer* for November with process illustrations.

Further notes on the plants known as Peyote and Ololiuhqui, by Dr. Urbina, are contained in recent numbers of the *Anales del Museo nacional de México.*

The botanical origin of coca leaves is considered quite fully by Rusby in *The Druggist's Circular* for November.

Two papers on marl, of botanical interest, are published in No. 6 of the current volume of the *Journal of Geology* by Professor C. A. Davis.

Dr. Kuckuck, in Bd. IV, N.F., of the *Wissenschaftliche Meeresuntersuchungen* of the Commission for the scientific investigation of the German Sea, describes his method of cultivating algæ in the open seas.

A voluminous account of the older Mesozoic flora of the United States, by Professor Lester F. Ward, is separately published from Vol. XX of the *Annual Report of the United States Geological Survey.*

An elaboration of the fossil cycads of the Yale museum, by Professor Ward, is reprinted from the *American Journal of Science.*

A biographic sketch of Torrey, and an account of the work of the Torrey Botanical Club, appear in the October *Bulletin* of that organization.

A portrait of Ernest Roze is published in No. 7 of the current volume of the *Bulletin de la société botanique de France.*

PALEOBOTANY.

A New Book on Fossil Plants.[1] — Dr. Scott's important contributions to our knowledge of fossil plants are too well known to students of palæobotany to need any introduction. The present work is a very satisfactory summary of much of his former work, and the substance of it was first presented in the form of a series of lectures delivered at University College, London, in 1896. The lectures, however, have been entirely recast and brought up to date.

[1] Scott, D. H. *Studies in Fossil Botany.* London, Adam and Charles Black, 1900. xiii + 533 pp., 8vo, 151 figs.

The plants dealt with are, for the most part, the vascular Palæozoic plants, — Pteridophytes and Gymnosperms, — but some space is also given to the Mesozoic types.

The first chapter is partly devoted to an exposition of the aims of palæobotany and explains the different forms in which fossil plants have been preserved; the latter part of the first chapter and the two following are devoted to the Equisetales.

The earliest forms of Equisetales (Archæocalamites) occur in the upper Devonian. These oldest types were in many respects allied to the sole living genus, Equisetum. From this stock arose the much more specialized Calamites of the Carboniferous, which showed a secondary growth of the vascular bundles and more specialized fructifications. The peculiar fossils described under the name "Annularia" are supposed to be the smaller leafy twigs of Calamites. The structure of the latter is often preserved most beautifully and shows great similarity to that of Equisetum, with which the sporangia also have much in common. The discovery of heterospory in certain species is an interesting point, but it was apparently much less marked than among the Lycopods and Ferns. Dr. Scott is very positive in maintaining the strictly pteridophytic nature of all the Calamarieæ. No Calamites are found above the Permian, the Mesozoic Equisetales being for the most part closely allied to Equisetum.

Chapter IV deals with the Sphenophyllales, which Dr. Scott considers are entitled to rank as a fourth class of the Pteridophytes, having certain affinities with both the Lycopods and Equisetales. Of existing genera, Psilotum approaches Sphenophyllum in the character of the vascular bundles, but as practically nothing is known of the fossil Psilotaceæ, it is questionable how close the relationship really is.

The very remarkable fructification known as Cheirostrobus, which apparently combines calamarian and lycopodiaceous characters, is considered by Dr. Scott to belong to the Sphenophyllales and to confirm his view that "the Sphenophyllales were the highly modified representative of an ancient stock from which both Lycopods and Horsetails have diverged."

Chapters V–VII deal at length with the very abundant remains of Lycopodiales. As was the case with the Equisetales, the group culminated in the Palæozoic era, and in the later formations only the smaller and less specialized types are encountered. Heterospory, which still occurs in Selaginella, was very pronounced, and in the case of certain forms closely resembling typical Lepidostrobus,

seeds were actually developed. In spite of this, Dr. Scott is not inclined to admit that there is any connection between the arborescent Palæozoic Lycopods and the modern Conifers, although this is suggested by the similarity in habit of the two classes. He concludes that there is no satisfactory proof that the early Lycopods gave rise to any group of the higher plants — a conclusion with which all botanists will not agree.

The Ferns are the subject of two chapters, in which the different types are clearly treated. Abundant remains of Ferns, often most beautifully preserved, occur in all the formations from the Devonian onward. Unlike the other three phyla of Pteridophytes, the Ferns have held their own, and at present constitute a very important element of the vegetation of many regions, especially in the mountains of the tropics.

The fructifications are in many cases well preserved, and it is clear that the earlier Ferns were mostly types allied to the existing Marattiaceæ, which are thus shown to be a very old type, — a conclusion reached independently by the writer some years ago, from a study of the living forms. The fossil Marattiaceæ, however, showed far greater diversity than the few existing genera. The other existing group of Eusporangiatæ — the Ophioglossiæ, — which in certain respects seems to present very primitive characters, is very unsatisfactorily known in a fossil state, perhaps due to the very slight development of firm tissues in most of them.

The occurrence of leptosporangiate Ferns in the Palæozoic rocks is rare, and their affinities doubtful. A small number of types, perhaps allied to modern Gleicheniaceæ and Osmundaceæ, have been discovered, but it is not until the Mesozoic is reached that any considerable number of these are encountered. Last of all to appear are the Polypodiaceæ, preëminently the modern fern type.

Among the most interesting of the Mesozoic Ferns were the Matoninæ, now represented by the single genus Matonia of the Malayan region. This is a synthetic type, combining characters of the Cyatheaceæ and Gleicheniaceæ.

One of the most important results of recent work with the Palæozoic fossils is the discovery of a group of plants intermediate between the true Ferns and the Cycads. These Cycadofilices have been extensively studied by Scott and Seward in England, as well as by several continental workers. Among the best known genera are Lyginodendron, Heterangium, and Megaloxylon. Many of these forms which are formed from the lower Carboniferous and the Permian,

have been described as Ferns, the best known being the genera Neuropteris and Alethopteris.

The earliest of all true seed-bearing plants were undoubtedly the remarkable group, the Cordaiteæ, as to whose affinities there has been much discussion. Their remains occur abundantly from the Devonian through the Carboniferous. They present certain coniferous features, especially in the character of the secondary wood, while, on the other hand, their structure recalls the Cycads, which they resemble in the structure of the leaves. Unlike most fossil plants, the flowers and fruits have been preserved with extraordinary perfection, even to the pollen grains which are found within the pollen chamber, much as in the case of living Cycads. Most extraordinary of all, so perfectly are the pollen grains and ovules preserved, that the antheridia and archegonia are still recognizable!

Whether the Cordaiteæ really represent a type intermediate between Cycads and Conifers, may perhaps be questioned, but they certainly are one of the most interesting of all the groups of fossil plants.

The Cycads, although occurring sparingly in the later Palæozoic formations, are especially characteristic of the Mesozoic, where, as is well known, they formed one of the principal plant types. It is evident that the Mesozoic cycadean forms were much more varied than the existing genera, which show comparatively little variety of structure.

While some of the fossil forms approach closely their living representatives, both in this character of the vegetative and reproductive parts, others are extremely different, this being especially true of the Bennettiteæ. These combined typical cycadean vegetative characters with fructifications of a very different kind, and not readily comparable to that of the true Cycads. The seeds, which have been very perfectly preserved, show a large dicotyledonous embryo, nearly filling its cavity. These remarkable fossils are especially abundant in our own Potomac formation, and from Jurassic and Cretaceous formations of the Black Hills, from which Professor Lester Ward has described many new species.

Of the true Cycadaceæ, Cycas probably goes back at least to the Lias.

The Coniferæ are but briefly treated. The earliest typical Conifers seem to have been allied to the Taxodieæ, to which the fossil genus Voltzia of the Upper Permian and Triassic seems to be allied. The Permian genus Walchia, which has been supposed to be allied to the

Araucarieæ, is only known from vegetative remains, the fructification being quite unknown. Unmistakable Araucarieæ are not known anterior to the Jurassic. The Abietineæ are probably somewhat more recent, but Cupressineæ are found in the Jurassic. The Taxineæ (exclusive of the much more ancient Ginkgo) are first met with in the Cretaceous.

The extraordinary genus Ginkgo, which with the Cycads represents the oldest existing type of seed-bearing plants, and is now represented by the solitary species, *G. biloba*, is recognized by Dr. Scott as the representative of a distinct order, Gingkoaceæ, which is represented by numerous forms in the later Palæozoic and earlier Mesozoic formations. Dr. Scott agrees with Seward in assuming a somewhat near relationship between the Gingkoaceæ and the Cordaiteæ.

The concluding chapter is occupied with a summary of the general conclusions presented in the preceding chapters. We can hardly agree with the conclusion that the great antiquity of the Pteridophytes, and the absence of the remains of Bryophytes in the Palæozoic formations, is a sound argument for the entire independence of the great divisions of Archegoniates. There certainly is no evidence of any other forms from which they could possibly have sprung, while the evidence of comparative morphology is overwhelmingly in favor of a common origin for all Archegoniates. The questions of their interrelationships are by no means so evident.

The book is handsomely printed, and the illustrations are well executed and very helpful in elucidating the text. We can heartily recommend the book to all botanists interested in the fascinating study of plant pedigrees.

D. H. C.

RECORD OF GIFTS, APPOINTMENTS, RETIREMENTS, AND DEATHS FOR THE YEAR 1900.

Educational Gifts for 1900. — Below we have summarized the gifts to colleges, institutes, and libraries which have come to notice during the eleven months of 1900, ending November 30. In its compilation we acknowledge especial indebtedness to *Science*. Scattered here and there the items have little significance, but gathered in this form they are ample evidence of the generosity of the American people.

Amherst College, $10,000, by the will of Edward N. Gibbs.
Barnard College, New York, $100,000.
Bates College, $20,000, for a library building, from Joseph A. Coran.
Beloit College, a conditional gift of $200,000, from one of its trustees.
Berea College, $50,000, from Dr. D. K. Pearson ; $150,000, by subscription.
Blackstone Library of Branford, Conn., $100,000, by the will of Timothy T. Blackstone.
Boston University, $50,000, by the will of O. H. Durrell.
Bowdoin College, $150,000, from Gen. Thomas H. Hubbard, for a library building.
Brooklyn Institute of Arts and Sciences, $15,000, by the will of Joseph C. Hoagland.
Brown University, $1,120,000, by subscription ; $250,000, from John D. Rockefeller ; $3500, by the will of Charles H. Smith ; a conditional gift of from $8000 to $30,000, by the will of the late A. D. McLellan ; $25,000, by the wills of each, John Nicholas Brown and Harold Brown.
Carleton College, $50,000 from Dr. D. K. Pearson.
Carnegie Institute, Pittsburg, Pa., funds for its enlargement from Andrew Carnegie, not to exceed $3,000,000.
Catholic University of America, $20,000, by the will of Mrs. Rebecca Reyburn ; $50,000, from Michael Cudahy.
Chicago Art Institute, $50,000, by the will of the late Sidney A. Kent.
Clark University, an indeterminate amount, by the will of the founder, Jonas Clark.
College of Physicians and Surgeons of Chicago, $25,000, from Dr. W. E. Quinn, for its library ; and $25,000, from Dr. D. A. K. Steele, for the pathological laboratory.
College of Physicians of Philadelphia, $5000, by the will of Dr. J. M. Da Costa.
Colorado College, $50,000, from Dr. A. K. Pearson.

Columbia University, $10,000, for books, from an anonymous donor; $100,000, by the will of the late Dorman B. Eaton, for a professorship of municipal science and administration; $100,000, from John D. Rockefeller, to endow the chair of psychology.

Cooper Union, New York, residuary legatee of the late John Halstead, the amount approximating $250,000; $300,000, from Andrew Carnegie; $200,000, from Abram S. Hewitt and Edward Cooper.

Cornell University, $80,000, anonymously, for a building for anatomy and physiology.

Covington, Ky., $40,000, from Andrew Carnegie, for a public library.

Danielson, Conn., $15,000, for a public library, by the will of Edwin H. Bugbee.

James Milliken gives in two gifts $716,000, for an industrial school in Decatur, Ill. Citizens have given $100,000 to the school, and $100,000 more is promised.

Earlham College, $25,000, from Frances T. White.

East Orange, N. J., $50,000, from Andrew Carnegie, for a public library.

Emporia College, $50,000, from Andrew Carnegie, for a library building.

Essex Institute, $10,000, from the estate of the late Walter Dixon.

Fairmount College, $50,000, from Dr. D. K. Pearson.

Fargo College, $50,000, from Dr. D. K. Pearson.

Hackensack, N. J., public library, land and a building to cost from $30,000 to $40,000, from William M. Johnson.

Hampden Institute, $100,000, by the will of Collis P. Huntington.

Harvard University, $100,000, by the will of the late Dorman B. Eaton, for the chair of science of government; $100,000, by the will of Mrs. Caroline Brewer Croft, for researches into the cause and cure of cancer; $2000, by the will of Barthold Schlesinger.

Haverford College, $40,000, by an alumni subscription for a gymnasium.

Kenyon College, $10,000, from Mr. Samuel Mather of Cleveland; $15,000, from Mr. J. P. Stevens, for a library fund; $5000, by the will of John Sherman.

Lafayette College, $45,000, by the will of Joseph E. Smaltz.

Lehigh University, $300,000, by the will of Frank Williams.

McGill University, $200,000, from Sir William C. MacDonald.

McKenzie College, $75,000, from Dr. D. K. Pearson.

Marinette, Wis., $50,000, from Isaac Stephenson, for a public library building.

Massachusetts Institute of Technology, $2000, by the will of Barthold Schlesinger.

Mechanics Institute of Rochester, N. Y., $200,000, from George Eastman.

Middlebury College, $50,000, from Ezra Warner, for a science building.

Mt. Holyoke College, $200,000, from Dr. A. K. Pearson.

New York Botanical Garden, $20,000, and one-twelfth of the residual estate of Judge Charles P. Daly.

New York University, $100,000, from Miss Helen Gould, for the erection of a "Hall of Fame for Great Americans"; $2500, from Professor and Mrs. E. R. Shaw, for a scholarship ; $20,000, by the will of the late Robert Schell.

Oberlin College, $60,000, from Louis H. Severance, for a chemical laboratory ; $50,000, from Dr. and Mrs. Lucius C. Warner, for a men's gymnasium ; $75,000, by the will of Mrs. Caroline E. Haskell; $40,000, by the will of William Osborne ; $5000, by the will of John Sherman.

Ohio Wesleyan University, $10,000, from Mrs. Elizabeth Mebarry ; $35,000, by the will of Mrs. Eliza Chrisman.

Onarga College, $20,000, from Dr. A. K. Pearson.

Peabody Academy of Science at Salem, $26,000, towards an addition to its building.

Philadelphia, a building valued at $1,000,000, to the city, by P. A. B. Widener, for a free library and art gallery.

Philadelphia Academy of Natural Sciences, one-sixth of the estate of the late Charles E. Smith, estimated at $500,000.

Andrew Carnegie proposes to give buildings and an endowment of $1,000,000 for a polytechnic school in Pittsburg.

Princeton University, $45,000, by the will of Joseph E. Smaltz ; $40,000, by the will of Dr. John S. Sayre, a portion to be used for fellowships in applied electricity and applied chemistry.

Radcliffe College, $2,000, by the will of Barthold Schlesinger.

Ripon College, $15,000, from O. H. Ingham, towards the school of science building.

Rush Medical College, $50,000, from Dr. Nicholas Senn.

Rutgers College, $10,000, by the will of the late Robert Schell.

Public Library, St. Albans, Vt., $10,000, by the will of Gov. J. G. Smith.

St. Lawrence University, $24,000, from a friend.

Salem Public Library, $10,000, by the will of the late Walter Dixon.

Spellman Seminary, $180,000, from John D. Rockefeller.

Syracuse University, $25,000, by the will of the late Erastus F. Holden.

Teacher's College of New York, $25,000, by the will of Miss Eliza T. Bryson, for a scholarship.

Tufts College, $45,000, by the will of Walter Dixon, also a third of the residuary estate.

Tulane University, $50,000, from Mrs. Caroline Tilton, for library purposes.

Union College, $10,000, from members of the Mather family.

University of California, $10,000, for books, $100,000 additional, subject to an annuity, and $150,000 in real estate, from Mrs. Jane K. Sather.

University of Chicago, $125,000, from A. C. Bartlett ; $50,000, by will of the late Sidney A. Kent.

University of Pennsylvania, $250,000, from the estate of H. H. Houston ; $50,000, for dormitories, the residue unrestricted ; $5000, by the will

of Dr. J. M. Da Costa; $250,000, from Mrs. Thomas McKean, for the law school building.

University of the South, $50,000, from George W. Quintard, of New York.

University of Topeka (proposed), about $250,000, by the will of Mrs. Eliza Chrisman.

Vanderbilt University, $250,000, by the will of the late Mary J. Furman.

Washington University, property yielding from $120,000 to $130,000 a year, from Samuel Cupples and Robert S. Brookings.

Washington and Lee University, $3000, by the will of Mrs. Juliet S. Bushford, for a scholarship.

Wellesley College, about $100,000, by the will of Captain George S. Towle; $109,000, by subscription; $100,000, from John D. Rockefeller.

Yale University, $1000, from Professor G. J. Brush; $2500, from an anonymous donor; $5000, from Mrs. Isaac H. Bradley, for lectures; $700, by the will of Dr. James Campbell, for the senior prize; $1000, from Mrs. H. F. English, for prize fund in art school; $1000, from ex-President Dwight, for the art school; $30,000, from W. E. Dodge. It is difficult to say how much of the bicentennial fund, amounting to over $1,000,000, is to be counted as the gifts of the year 1900.

Yankton College, $50,000, from Dr. D. K. Pearson.

York, Pa., $50,000, from Andrew Carnegie, for a public library.

APPOINTMENTS.

Dr. D. Anisito, professor of botany and zoölogy in the medical school at Asuncion, Paraguay. — Dr. George H. Ashley, professor of natural history in the College of Charleston, S. C. — Charles E. Banker, assistant in normal histology, Columbia University. — W. Bergt, professor extraordinary of geology in the Breslau Technical School. — Dr. R. H. Chittenden, professor of physiology in the medical school of Yale University. — Dr. E. B. Copeland, professor of botany in the University of West Virginia. — Dr. A. S. Eakle, instructor in petrology in the University of California. — Dr. Paul Eisler, professor extraordinary of anatomy at the University of Halle. — Dr. E. Ficalbi of Messina, director of the zoölogical collections of the University of Padua. — Carlton P. Flint, assistant in anatomy in Columbia University. — William E. Ford, instructor in mineralogy in Yale University. — Dr. B. T. Galloway, custodian of the grounds of the United States Department of Agriculture. — Dr. Gasparini, professor of anatomy in the medical school at Asuncion, Paraguay. — L. C. Glen, professor of geology at Vanderbilt University, Nashville, Tenn. — Dr. A. W. Grabau, lecturer in geology in Tufts College. — Dr. Lawrence E. Griffin, instructor in zoölogy in the Western Reserve University. — Dr. Joseph B. Grzybowski, docent for paleontology in the University of Cracow. — Dr. G. Gürich, professor of geology and mineralogy in the University at Breslau. — Dr. R. Hesse,

professor extraordinary of zoölogy in the University at Tübingen. — Dr. T. C. Hopkins, professor of geology in Syracuse University. — Dr. F. H. Howard, instructor in physiology in Williams College. — Dr. F. Insfran, professor of histology in the medical school at Asuncion, Paraguay. — Dr. S. Kästner, professor extraordinary of anatomy in the University at Leipzig. — Cyrus A. King, instructor in botany in Indiana University. — Dr. L. Kolderup-Rosenvinge, docent for botany in the Kopenhagen Technical School. — Dr. Kolkwitz, docent for botany in the agricultural school at Berlin. — Professor A. Kossel of Marburg, professor of physiology at Heidelberg. — Professor K. Lampert, curator of the royal natural history collections at Stuttgart. — Dr. August Leppla, state geologist of Prussia. — Dr. A. Loewy, professor of physiology in the University of Berlin. — Dr. C. E. Lord, assistant in mineralogy and petrography in Harvard University. — Alexander Macphail, professor of anatomy in St. Mungo's College, Glasgow. — Maud Metcalf, assistant in botany in Wellesley College. — Dr. W. Nagel, professor extraordinary of physiology in the university at Freiburg. — Professor Henry F. Osborn, vertebrate paleontologist of the United States Geological Survey. — Dr. Oustalet, professor of zoölogy in charge of mammals and birds in the Musée d'Histoire Naturelle at Paris. — Percy J. Parrot, entomologist to the experiment station at Geneva, N. Y. — Dr. P. Peña, professor of physiology in the medical school at Asuncion, Paraguay. — Dr. N. von Raceborski, professor of botany in the agricultural school at Dublany, Galicia. — Professor A. Richter, director of the botanical institute and gardens of the university at Klausenburg. — Dr. F. Römer of Breslau, curator of the Senckenberg Museum at Frankfurt a. M. — Dr. G. E. Rogers, demonstrator in anatomy in the University of Cambridge. — Professor la Valette St. George, rector of the university at Bonn. — Dr. Sauer, professor of mineralogy in the Stuttgart Polytechnic School. — Dr. Alfred Schaper, professor extraordinarius of anatomy in the university at Breslau. — Dr. F. Schulz, professor extraordinary of physiology in the university at Jena. — Dr. M. Schwarzmann, docent for mineralogy in the university at Giessen. — Lena Edwards Shetley, assistant in zoölogy in Wellesley College. — D. N. Shoemaker, assistant in zoölogy in the Johns Hopkins University. — Dr. G. Elliot Smith, professor of anatomy in the medical school at Cairo, Egypt. — Dr. R. Wilson Smith, professor of botany in McMaster University, Toronto. — Dr. O. Zur Strassen, professor extraordinary of zoölogy in the university at Leipzig. — Dr. Tchermack, assistant in physiology in the university at Halle. — Dr. Georg Thilenius, professor extraordinarius of anthropology in the university at Breslau. — Dr. Victor Uhlig of Prag, professor of paleontology in the university at Vienna. — Dr. Ernst Weinschenk, professor extraordinarius of petrography in the University of Munich. — Mr. A. F. Woods, chief of the Division of Vegetable Physiology and Pathology in the United States Department of Agriculture. — Dr. Oskar Zeise, district geologist in the Geological Institute at Berlin.

RETIRED.

Professor T. G. Bonney, from the chair of geology in University College, London, after a service of thirty years. — T. Nelson Dale, instructor in geology in Williams College. — Dr. H. von Eck, professor of geology in the Stuttgart Technical School. — Carl Gegenbaur, professor of anatomy in the university at Heidelberg, at the age of 74. — Dr. B. Klunzinger, professor of zoölogy in the Stuttgart Technical School. — Dr. E. Schmidt, professor of anthropology and ethnology in the university at Leipzig.

DEATHS.

Sir Henry Wentworth Dyke Acklund, the well-known anatomist and physician, October 16, aged 85. — Dr. John Anderson, zoölogist and former curator of the Indian Museum at Calcutta, at Buxton, England, aged 66. — Paul Blanchet, explorer, of yellow fever, in Senegal. — Dr. G. Clautrian, assistant in the botanical institute of the University of Brussels, at Davos, Switzerland, May 23, aged 37. — Dr. A. B. Frank, professor of botany in the Agricultural School in Berlin, September 27, aged 61. — Dr. S. Gheorgieff, professor of botany in Sofia, Bulgaria, May 22. — I. Ingenitzky, entomologist, at Nowovossiisk, Russia, May 20. — Abbé A. B. Langlois, botanical collector, at St. Martinsville, La., August 1. — Dr. Joseph Mik, student of Diptera, at Vienna, October 13, aged 62. — Victor Lopez Sevane, ornithologist and entomologist, at Coruña, Spain, July 14. — General Sir R. Murdoch Smith, director of the Museum of Science and Art, at Edinborough, June 3. — Miss Margaret Stokes, an Irish archæologist. — Dr. A. von Strombeck, geologist, in Braunschweig, July 25, aged 91. — Professor G. H. F. Ulrich, geologist and director of the School of Mines at Otago, New Zealand, in May, as the result of an accident while collecting.

CORRESPONDENCE.

To the Editor of the American Naturalist:

Sir, — Under the name of *Xenichthys xenurus*, and afterward that of *Kuhlia xenura*, a fish in the U. S. National Museum, No. 4356, which was found in a bottle labeled "San Salvador," was described by Jordan and Gilbert. I have since had serious doubts whether this specimen really came from San Salvador and have thought that it was derived from some Asiatic source. Mr. Barton A. Bean has compared it at my request with the description of *Kuhlia malo* from the Hawaiian Islands. According to Mr. Bean it agrees perfectly with this species, except that the depth of body is 3½ times in length, while in the adult of the other it is from 2⅔ to 3. This difference is doubtless due entirely to difference in age. The pectoral fin has the measurement recorded by Boulenger for *Kuhlia malo*, and the black on the posterior margin of the caudal is very apparent. *Kuhlia xenura* should therefore be stricken from the list of American fishes. It is probable that the type came from Honolulu, where *Kuhlia malo* is very abundant.

D. S. J.

Stanford University, California,
November 15, 1900.

PUBLICATIONS RECEIVED.

Bailey, L. H. Botany. An Elementary Text for Schools. New York, Macmillan, 1900. xiv, 355 pp., 8vo, 500 figs. $1.10. — Du Chaillu, Paul. The World of the Great Forest. How Animals, Birds, Reptiles, Insects, talk, think, work, and live. Illustrations by C. R. Knight and J. M. Gleeson. New York, Scribner's, 1900. xiii, 323 pp., 8vo. $2.50. — Korschelt, E., and Heider, K. Text of the Embryology of Invertebrates. Translated from the German by Matilda Bernard. Revised and edited with additional notes by Martin F. Woodward. Vol. iv, Amphineura, Lamellibranchia, Solenoconcha, Gastropoda, Cephalopoda, Tunicata, Cephalochorda. London, Swan, Sonnenschein & Co. New York, Macmillan, 1900. xi, 594 pp., 8vo, 312 figs. $4.50. — Michaelsen, W. Das Tierreich. 10. Lieferung, Vermes, Oligochæta. Berlin, Friedländer, 1900. xxix, 575 pp., 8vo, 13 figs. 35 marks. — Migula, W. A. de Bary's Vorlesungen über Bakterien. Dritte Auflage durchgesehen und theilweise neu bearbeitet. Leipzig, Engelmann, 1900. vi, 186 pp., 8vo, 41 figs. 3.60 marks. — Mitchell, P. Chalmers. Thomas Henry Huxley. A Sketch of his Life and Labors. New York, Putnams, 1900. xvii, 297 pp., 8vo. Illustrated. — Pepoon, H. S., Mitchell, W. R., and Maxwell, F. B. Studies of Plant Life. A Series of Exercises for the Study of Plants. Boston, D. C. Heath & Co., 1900. xii, 95 pp., 8vo. $0.50. — Scott, D. H. Studies in Fossil Botany. London, Adam and Charles Black, 1900. xiii, 533 pp., 8vo, 151 figs. $2.75. — Tillman, S. E. A Text-Book of Important Minerals and Rocks with Tables for the Determination of Minerals. New York, John Wiley & Sons, 1900. viii, 176 pp., 8vo, 38 figs. $2.00. — United States War Department. Report on the Census of Cuba, 1899. Washington, Government Printing Office, 1900. 786 pp., plates, maps, etc. — Verworn, M. Das Neuron in Anatomie und Physiologie. Jena, Fischer, 1900. 54 pp., 8vo, 22 figs. 1.50 marks. — Wallace, A. R. Studies, Scientific and Social. Two volumes. London, Macmillan, 1900. ix, 532 pp., 88 figs., and viii, 535 pp., 8vo, 25 figs. (?). $5.00. — Walter, H. E., Whitney, W., and Lucas, F. C. Studies of Animal Life. A Series of Laboratory Exercises for the Use of High Schools. Boston, D. C. Heath & Co., 1900. vi, 106 pp., 8vo. $0.50. Teacher's Book of Suggestions to accompany Studies of Animal Life. pp. xxxi.

Ashe, W. W. New North-American Plants — Some New Species of Cratægus. Notes on Some Dichotomous Panicums. N. C. Agr. Exp. Sta., *Bull. No. 175*. August, 1900, pp. 109–116. — Kincaid, T. Papers from the Harriman Alaska Expedition. VII, Entomological Results; (1) the Tenthredinoidea. *Proc. Wash. Acad. Sci.* Vol. ii, pp. 341–365. — Kincaid, T. Papers from the Harriman Alaska Expedition. VIII, Entomological Results; (2) the Metamorphoses of Alaskan Coleoptera. *Proc. Wash. Acad. Sci.* Vol. ii, pp. 367–388, Pls. XXII–XXVI. — Knight, W. C. Preliminary Report on the Artesian Basins of Wyoming. Wyo. Exp. Sta., *Bull. No. 45*. June, 1900, pp. 107–251, 14 plates. — Lambe, L. M. Sponges from the Coasts of Northeastern Canada and Greenland.

Trans. Roy. Soc. Can. [2]. Vol. vi, sect. iv, pp. 19-48, 6 plates. — LUCAS, F. A. A New Fossil Cyprinoid, Leuciscus turneri, from the Miocene of Nevada. *Proc. U. S. Nat. Mus.* Vol. xxii, pp. 333, 334, Pl. VIII. — LUCAS, F. A. The Pelvic Girdle of Zeuglodon. Basilosauris Atoides (Owen), with Notes on Other Portions of the Skeleton. *Proc. U. S. Nat. Mus.* Vol. xxiii, pp. 327-331, Pls. V-VII. — MILLER, G. S., JR. A Second Collection of Bats from the Island of Curaçao. *Proc. Biol. Soc. Wash.* Vol. xiii, pp. 159-162. — MILLER, G. S., JR. A New Gerbille from Eastern Turkestan. *Proc. Biol. Soc. Wash.* Vol. xiii, pp. 163, 164. — MORRIS, E. L. Some Plants of West Virginia. *Proc. Biol. Soc. Wash.* Vol. xiii, pp. 171-182. — OSBORN, H. The Genus Scaphoideus. *Journ. Cincinnati Soc. Nat. Hist.* Vol. xix, No. 6, pp. 187-209, Pls. IX, X. — PERKINS, G. H. Report of the State Geologist on the Mineral Industries of Vermont, 1899-1900. Burlington, 1900, 83 pp., 29 figs. — WHITEAVES, J. F. On Some Additional or Imperfectly Understood Fossils from the Cretaceous Rocks of the Queen Charlotte Islands, with a Revised List of the Species from these Rocks. *Geol. Surv. Canada*, Mesozoic Fossils. Vol. i, Pt. iv, pp. 263-307, Pls. XXXIII-XXXIX. — WITHERS, W. A. Another Warning in Regard to Compost Pedlars. N. C. Agr. Exp. Sta., *Bull. No. 173.* June, 1900, pp. 83-116.

Brooklyn Medical Journal. Vol. xiv, No. 11. November. — *Insect World.* Vol. iv, No. 10. October. — *International Monthly.* Vol. ii, Nos. 5, 6. November. — *Journal of Zoöphily.* Vol. ix, No. 11. November. — *O. S. U. Naturalist.* Vol. i, No. 1. November. — *Popular Astronomy.* Vol. viii, No. 9. November. — *Science Gossip.* N.S., vol. vii, No. 78. November. — *Spelunca. Bull. Soc. Spéléologie.* Tome vi, Nos. 21, 22. — *Springfield Library Bulletin.* Vol. xx, No. 8. December.

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